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PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

138TH SESSION.

FROM NOVEMBER 1925 TO JUNE 1926.

LONDON:
PRINTED FOR THE LINNEAN SOCIETY,
BURLINGTON HOUSE, PICCADILLY, W.1,
BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

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PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON

(ONE HUNDRED AND THIRTY-EIGHTH SESSION, 1925–1926.)

5th NOVEMBER, 1925.

Dr. A. B. RENDLE, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 11th June, 1925, having been circulated, were confirmed.

The President proposed a cordial vote of thanks to the anonymous donor of the new Presidential Chair inaugurated that day, which was carried by acclamation.

Mr. John Stanhope Arkwright was admitted a Fellow.

A certificate in favour of Miss Elizabeth Alice Fraser, D.Sc., was read for the second time.

The following were proposed as Fellows:—Benjamin Bunting, N.D.A.; Miss Margaret Tribe, D.Sc., F.Z.S.; Henry Goland Robinson, M.Sc.(Dunelm.); Arthur Edward Wade; Alfred Reginald Stephenson Proctor; Alfred Harry Davidson, B.Sc.; Capt. Arthur Hugh Batten-Pooll, V.C., M.C.; Harold Augustus Hyde, B.A.; John Augustus Voelcker, M.A., Ph.D., F.I.C.; Frederick Claude Stern, O.B.E., M.C.; Baini Prashad, D.Sc.; James Levi Sager, M.A.(Cantab.); Sir Peter Henry Clutterbuck, C.I.E., C.B.E., F.R.G.S., F.Z.S.; John Everard Hosking; Stephen King Montgomery, B.A., B.Sc., M.R.C.S., L.R.C.P.; Ashley Gordon Lowndes, M.A.(Cantab.); Syed Jamaluddin; Miss Evelyn Vida Baxter, F.Z.S.; and Miss Leonora Jeffrey Rintoul, F.Z.S.

Hugh Hamshaw Thomas, M.B.E., M.A., Sc.D.(Cantab.), F.G.S., and the Rev. Philip Grafton Mole Rhodes, M.A.(Cantab.), D.D. (Frib.), were elected Fellows by ballot.

The President gave notice that all subsequent meetings in the Session would be available for ballot if required.

The first communication was by Mr. Marius Maxwell, F.L.S., on "The Home of the Eastern Gorilla," of which the following is an abstract.

In order to obtain photographs of the Eastern or Burunga Gorilla (*Gorilla gorilla beringeri*) the author, in company with Mr. J. H. Barnes, recently paid a short visit to the Burunga Mountains, near Lake Kivu, in the Belgian Congo. The taking of photographs in the rain-soaked forests of these mountains was found to be a very difficult business—as, in addition to the light being very poor, the dense nature of the undergrowth, in most cases, prevented good results. Gorillas were found to be fairly plentiful and no difficulty was experienced in getting to close quarters with several family groups. A large number of snapshots were taken of these apes, but only two were successful; coloured slides of these were exhibited. One photograph showed a "close-up" of an old male Gorilla standing erect in thick forest, with just its head and shoulders exposed. This animal made a very noisy demonstration while advancing on the camera, but eventually retired somewhat hastily. The other slide showed a female Gorilla, moving away from the photographer, and carrying a young one on her back. In this picture there was also to be seen an immature male indulging in some curious antics, apparently with the idea of frightening away the intruder.

A series of slides showing the sleeping-places and shelters of these apes were also exhibited; in one case a kind of platform had been constructed, reminiscent of the "nest" of the Orang Utan, but built close to the ground.

Photographs of Mt. Mikeno and the other mountains of the Burunga Range were taken when the clouds and lighting conditions permitted; slides of these were shown to illustrate the type of country inhabited by this Eastern race of Gorilla.

The discussion was opened by the President.

Sir Sidney Harmer, F.R.S., referred to the conflict of statements as to the disposition of the Gorilla. He pointed out that the older accounts of the ferocity of the animal were based on observations of the Western Gorilla only, and it was possible that the Western was more ferocious than the Eastern.

In reply to questions by Prof. E. W. MacBride, F.R.S., Mr. Maxwell stated that the West African Gorilla is less hairy than the Eastern and does not possess the fleshy sagittal crest of the latter; the Eastern Gorilla, although its natural mode of progression is on all fours, is capable of walking on its hind legs, resting its weight on the outer edge of the foot, with the toes

slightly bent inwards but not touching the ground. Mr. J. T. Cunningham stated that a young Gorilla at the Zoological Gardens rested its weight on the outer edge of the foot. Mr. H. N. Ridley, F.R.S., suggested that this attitude pointed to the Gorilla being originally arboreal. Col. Tull Walsh related that a young Gibbon which he had the opportunity of observing in Calcutta walked just like a child, holding the hand of a servant. Mr. M. C. A. Hinton expressed the opinion that the West and East African Gorillas were different species.

The second communication was by Miss E. Bolton, M.Sc., F.L.S.: "Validity of certain species in *Neuropteris* Brongn."

The species of *Neuropteris* considered fall naturally into three species-groups. The members of each group are linked together by certain common pinnule characters, whilst possessing others peculiar to themselves. Each group as a whole consists of types usually regarded as species, and it would appear that the members of each group are more closely inter-allied than they are to any other species. Intermediate species form connecting-links between species-groups and between species within these groups. As a result of this work, the following conclusions have been arrived at:—(1) That very few of the accepted species of *Neuropteris* are species in the ordinary acceptance of the term, but are varietal forms belonging to a few group-species, and owe their characters to age and the position they occupied on the rachis. (2) It is claimed that in order to determine true specific identity and relationship diagnostic characters should be based upon the following pinnule characters:—age, position on rachis, shape, and character of lamina. Working on these lines, the characters of fifteen well-known species have been analysed and referred to species-groups designated as the "*Neuropteris flexuosa*," "*Neuropteris obliqua*," and "*Neuropteris auriculata*" species-groups.

The President referred to the great value of critical work such as Miss Bolton had undertaken. Dr. D. H. Scott, F.R.S., commented on the difficulty of specific determination in these genera owing to the absence of sporangia, and expressed his concurrence with the President's remarks as to the value of Miss Bolton's work.

The next paper on the agenda, by Dr. H. S. Holden, F.L.S., and Mr. S. H. Clarke, "Seedling Structure of the Lime-tree," was postponed.

The last communication was by the General Secretary, who showed copies of the new Library Catalogue. He said that nearly thirty years had passed since the previous Library Catalogue was issued (1896), and it was nearly ten years in preparation. As shown by many reports to the Council from Committees set up to hasten the compilation, it was not only tedious, but costly.

The present Catalogue was begun about five years ago. Printing was started in 1923, and progress was fairly maintained to the return of the last sheet for press in September 1925. Proof-reading was shared by two of the staff, but most was done after office hours. The result has been that the heavy editorial expenses of the previous Catalogue were entirely avoided.

19th November, 1925.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 5th November, 1925, having been circulated, were confirmed.

Mrs. Cecilia Mary Nutter Le Lacheur and the Rev. Philip Grafton Mole Rhodes, M.A.(Cantab.), D.D.(Frib.), were admitted Fellows.

Certificates were read for the second time in favour of the following:—Benjamin Bunting, N.D.A.; Miss Margaret Tribe, D.Sc., F.Z.S.; Henry Goland Robinson, M.Sc.(Dunelm.); Arthur Edward Wade; Alfred Reginald Stephenson Proctor; Alfred Harry Davidson, B.Sc.; Capt. Arthur Hugh Batten-Pooll, V.C., M.C.; Harold Augustus Hyde, B.A.; John Augustus Voelcker, M.A., Ph.D., F.I.C.; Frederick Claude Stern, O.B.E., M.C.; Baini Prashad, D.Sc.; James Levi Sager, M.A.(Cantab.); Sir Peter Henry Clutterbuck, C.I.E., C.B.E., F.R.G.S., F.Z.S.; John Everard Hosking; Stephen King Montgomery, B.A., B.Sc., M.R.C.S., L.R.C.P.; Ashley Gordon Lowndes, M.A.(Cantab.); Syed Jamaluddin; Miss Evelyn Vida Baxter, F.Z.S.; and Miss Leonora Jeffrey Rintoul, F.Z.S.

The following were proposed as Fellows:—John McDonald, D.F.C., B.Sc.(Hons.); Miss Maud Williams, B.Sc.; The Rev. Charles Herbert Binstead, M.A.(Oxon.); and Prof. Francis Ernest Lloyd.

Miss Elizabeth Alice Fraser, D.Sc., was elected a Fellow.

In the unavoidable absence of the authors, the paper by Dr. H. S. Holden and Mr. S. H. Clarke "On the Seedling Structure of *Tilia vulgaris*" was read by Mr. J. Ramsbottom. The following is a summary.

Although *Tilia vulgaris* Heyne flowers freely in England it rarely perfects seed, but 1923 seems to have been specially favourable, as in the spring of 1924 more than 70 seedlings were noted at Nottingham, upon which the present observations are based.

The seedling of *Tilia vulgaris* possesses two typically five-lobed

epigeal cotyledons. These lobes vary in size, and may also develop accessory lobes. The aerial parts are thinly pubescent, the hairs being of two types:—(*a*) unicellular hairs confined to the epidermal ridges above and below the veins of the cotyledon laminæ, but generally distributed over the hypocotyl; (*b*) club-shaped multicellular hairs confined to the upper surfaces of the cotyledons between the veins. The vascular system is tetrarch in plan, and typical root-structure is only attained some distance below the collet; seedlings showing triarchy or pentarchy also occur. Syncotylous seedlings, where the syncotyly is unilateral and pronounced, show triarch symmetry. The polycotylous seedlings examined were pentarch, though the pentarchy was not homologous with that found in dicotyls.

In the discussion following the paper, the President referred to the remarkable form of the cotyledons in *Tilia*, the lobing contrasting with the unbroken margins of cotyledons generally. He recalled the extensive work of Sir John Lubbock on seedlings, and his interpretation of the form of the cotyledon as an adaptation for packing within the seed-coat. The five-lobed cotyledon of *Tilia* was explained by Lubbock as an accommodation for packing within a round seed.

Dr. E. N. Miles Thomas commented on the impression of variability naturally obtained from a paper dealing with a large number of individuals of a single form. She briefly indicated the general and constant features of the anatomy of seedlings which she had summarized in the British Association Report of 1924. The most important of these features were:—(1) The primary alternating arrangement of xylem and phloem in hypocotyl and cotyledons as well as root, a significant arrangement, whether it related to phylogenetic or physiological causes, which many authors had failed to appreciate owing to the relatively mature age of the seedlings examined; (2) the production of root poles in the cotyledonary plane. She drew attention to the desirability of visualising the vascular system of seedlings as a whole, and suggested that the structure of the hypocotyl might prove to be the best point of departure for consideration and of the greatest phylogenetic importance.

Dr. E. J. Salisbury, referring to the frequency of Lime seedlings, mentioned their occurrence in large numbers in certain years as suggesting an intermittence in abundant seed-production comparable to that exhibited by the Beech. The small type of stomata found on the cotyledons, from their appearance, would seem to be water stomata. Twin stomata, such as the authors described, although of somewhat rare occurrence, are found in a considerable number of both monocotyledonous and dicotyledonous species. In general, they appear to be due to division of the stomate mother-cell.

Mr. A. J. Wilmott drew attention to the desirability of specimens from the tree or trees, from which the seedlings were derived, being made available for examination, so that there should be as little doubt as possible as to the species concerned.

The second communication was by Mr. L. R. Crawshay, "Sponge Fishery Investigations in the British West Indies." (Communicated by Dr. W. T. Calman, F.R.S., Sec.L.S.) It was illustrated by a long series of lantern-slides.

The Sponge Fishery Investigations in the British West Indies were instituted by the Colonial Office in 1920 for the purpose of studying the general existing conditions of these Fisheries, more especially in the Bahamas, and ascertaining the best means of provision for their protection and development. Among questions chiefly calling for attention, that of depletion of the sponge beds through unrestricted removal of the sponges over many years past is one of serious importance as affecting the whole future welfare of a fishery. Another important question, namely the cultivation of sponges from planted cuttings, offers undoubtedly valuable possibilities of development of a sponge fishery along the best lines for the improvement and extension of its resources. Inflation of these possibilities for purely commercial ends has unfortunately led to the dissemination of very misleading ideas regarding the main principles essential to success in sponge-planting, owing to which ill-judged and costly enterprises which have been undertaken without knowledge of the principles have tended much, by their unsuccessful results, to impede rather than to advance the progress of the subject from an economic point of view.

Economic subjects such as sponge culture, depletion, and all others relating to the general subject of sponge-fishery control, can properly be dealt with only in the light of knowledge gradually to be obtained by study of the living sponges, and especially in regard to such subjects as the relationships of the chief market types, and their form-variations, age, growth and growth-rate, and reproduction. With such subjects the investigations in the Bahamas during the past few years have been directly concerned. The paper briefly discussed the methods and progress of the work carried out, and the information so far obtained.

Dr. G. Claridge Druce showed a series of specially interesting British plants, some shown for the first time since their discovery; the species belonged to *Taraxacum*, *Thymus*, and *Anthriscus*. Owing to lack of time there was no opportunity of discussion.

3rd December, 1925.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 19th November, 1925, having been circulated, were confirmed.

The President referred to the recent death of our Honorary Member, H.M. Queen Alexandra. The Fellows rising in their places, the following address of sympathy to H.M. The King was read from the Chair:—

To the King's Most Excellent Majesty,—

The Humble Address of the President, Council, and Fellows of the Linnean Society of London.

Most Gracious Sovereign :

We, Your Majesty's most dutiful and loyal Subjects, the President, Council, and Fellows in General Meeting assembled, humbly beg leave to offer our deepest and most heartfelt sympathy with Your Majesty in the great sorrow which has befallen You and the Royal House in the death of Your beloved Mother, Queen Alexandra. Your Majesty's loss is our loss also, as Her late Majesty was one of our two Honorary Members.

Mrs. Emma Nora Barlow and Miss Elizabeth Alice Fraser, D.Sc., were admitted Fellows.

Certificates were read for the second time in favour of John McDonald, D.F.C., B.Sc. (Hons.), Miss Maud Williams, B.Sc., The Rev. Charles Herbert Binstead, M.A. (Oxon.), and Prof. Francis Ernest Lloyd.

The following were proposed as Fellows :—Roland Oscar Iliffe, M.A. (Cantab.), and Sushil Kumar Mukerji, M.Sc.; and Morley Benjamin Crane was proposed as an Associate.

The following were balloted for and elected Fellows :—Benjamin Bunting, N.D.A.; Miss Margaret Tribe, D.Sc., F.Z.S.; Henry Goland Robinson, M.Sc. (Dunelm.); Arthur Edward Wade; Alfred Reginald Stephenson Proctor; Alfred Harry Davidson, B.Sc.; Capt. Arthur Hugh Batten-Pooll, V.C., M.C.; Harold Augustus Hyde, B.A.; John Augustus Voelcker, M.A., Ph.D., F.I.C.; Frederick Claude Stern, O.B.E., M.C.; Baini Prashad, D.Sc.; James Levi Sager, M.A. (Cantab.); Sir Peter Henry Clutterbuck, C.I.E., C.B.E., F.R.G.S., F.Z.S.; John Everard Hosking; Stephen King Montgomery, B.A., B.Sc., M.R.C.S., L.R.C.P.; Ashley Gordon Lowndes, M.A. (Cantab.); Syed Jamaluddin; Miss Evelyn Vida Baxter, F.Z.S.; and Miss Leonora Jeffrey Rintoul, F.Z.S.

"A Preliminary Account of a Fungus in the Tissues of Coniferæ," by Prof. F. J. Lewis, D.Sc., F.L.S., was read by the Botanical Secretary in the absence of the author.

Observations have been made on *Larix laricina*, *Pseudotsuga Douglasii*, and *Abies lasiocarpa*, but the results recorded refer particularly to *Picea canadensis*, which has been collected from many habitats and varying in age from small seedlings to trees over two hundred years old. The cortex of the youngest rootlets is penetrated in every direction by fine hyphæ, which not only enter the living cells, but grow through the middle lamellæ of the

walls: the halves of the walls are completely separated by a plate of closely-convoluted hyphæ giving a tesselated appearance in lateral view. As these hyphæ die, penetration by younger hyphæ from the cavities of the cortical cells frequently occurs. The contents of the cortical cells disappear, often leaving large spherical masses to which radiate delicate deeply-staining hyphæ. These also penetrate the endodermal cells, and in some cases almost fill the lumen. Older rootlets from which the primary cortex has been cast off show the cells of the broad pericycle filled with masses of very fine branched hyphæ; where periderm is fully developed the phellome is frequently penetrated in every direction with hyphæ which also extend into the phelloderm. It is not possible to say yet whether this is the same fungus, as its hyphæ are much larger, clearly septate, not profusely branched, and exhibit different staining reactions.

Not only the periderm of the root, but also the periderm of the stem and the outer bud-scales are profusely penetrated by hyphæ; in fact, a mycelial mantle extends through the periderm from the root to the second-year shoots. Observations suggest that this fungal mantle is not connected with the true endophytic fungus in the deeper tissues; but the question must at present be left open.

In the winter condition of the old stems there occur chains of cortical cells filled with a network of profusely-branched hyphæ with frequent small intercalated vesicles. They extend into the medullary-ray cells in the inner region of the cortex, and can be recognized as exceedingly fine hyphæ in the medullary-ray cells in the outer layers of the xylem.

The distribution of the fungus in the unopened bud is particularly interesting because of its localization in certain enlarged cells irregularly distributed above the crown near the base of the embryonic leaves. The cells appear to be the earlier stages of the cortical cells, and are quite filled with a fine network of very small nodular cells, the filaments so formed branching repeatedly. As the meristematic cone bearing the embryonic leaves elongates, the fungus spreads upwards from the region of the crown forming a network of infested cells, and the same features occur in the young cortical cells outside the procambial strands. The non-vacuolated cells of the meristem do not show any signs of invasion by the fungus. In cells at a slightly older stage the hyphæ are applied closely to the cell-wall, forming a series of vesicles.

In the discussion that followed, the President referred to the difficulties under which isolated investigators, such as Prof. Lewis, had to conduct researches, and to the desirability of helpful criticism.

Mr. Ramsbottom pointed out that there were several matters which were not settled in this preliminary communication. The behaviour of the fungus in relation to the root suggested that it was an ordinary ectotrophic mycorrhizal one. Concerning the fungus in the stem, it would be interesting to know whether it was

constantly present or only occasionally ; also whether it was connected with the mycorrhizal fungus. Accumulated evidence led to the supposition that many Basidiomycetes may be concerned in forming mycorrhiza within the roots of the same species of Conifer, and field-observation showed that two or three different types of mycorrhiza may occur on the same tree. If the stem-fungus was joined with the root-fungus, were all Basidiomycetes able to spread from the roots, either singly or in company? If an unattached fungal mycelium existed in the stem, there was a possibility of a state of affairs such as we had in *Lolium*, where there was an internal mycelium near the stem-apex; but it was more likely that in the present case we had a parasitic fungus, definite in its attack. A species of *Picea* might have a hundred parasitic fungi.

Mr. R. Paulson remarked that mycorrhiza in Conifers was found on the quite superficial roots running an inch to an inch and a half below ground, and that its presence appeared to depend largely on there being sufficient moisture in the soil to permit of its development and continuance.

Dr. M. C. Rayner (visitor) pointed out that Melin's work on Conifers—*Picea*, *Pinus*, *Larix*—left no doubt as to the identity of the fungus, the structure of the mycorrhiza, or the cytology of the infected cells. Professor Lewis's description of root-infection in respect to the intercellular "net" agreed with the structure of the mycorrhiza long known to exist in Conifers. Melin had recently reported profuse intracellular infection with subsequent digestion of the mycelium in the cortical cells. Infection of the dead tissues of the periderm was invariable, but no evidence had been produced that the mycelium present was related to that forming mycorrhiza. With regard to stem-infection, if it were the rule, it would be necessary to establish identity of the mycelium before assuming relationship with the mycorrhizal fungi. In view of the close relationship known to exist in the root, it would not be altogether surprising to find an extension of infection to the shoot, as in Ericaceæ, but Professor Lewis's slides suggested parasitic infection.

Seven papers on the collections made during the Percy Sladen Memorial Fund Expedition in H.M.S. 'Sealark' were read (communicated by Prof. J. Stanley Gardiner, M.A., F.R.S., F.L.S.), the last five in title only. The following abstracts were supplied by the authors :—

Dr. Hugh Scott.—"The Ciidæ (Coleoptera) of the Seychelles."

Ciidæ are small or minute beetles, usually of almost cylindrical shape, which are found boring in fungi, often in very large numbers. A general catalogue of the family published in 1911 listed 20 genera and 237 species, from all parts of the world, a number which has since been somewhat increased. The only record from any of the islands visited by the Percy Sladen Trust

Expedition was that of a few species collected by Alluaud in the Seychelles in 1892, but not determined till now. The present report enumerates 20 species, 18 of which were found in the Seychelles proper, while one was found both in the Seychelles and Aldabra, and one in Aldabra only. Of the 20 species, 18 are described as new, and in almost every case figured. Six genera are represented, three of them being almost world-wide, and the other three described as new: of these latter, one is a genus which is structurally very distinct, and of which three species are known, two occurring in the Seychelles and one in the Mascarene Islands; the second of the new genera is also very aberrant in structure, is completely devoid of hind wings (as is the endemic Hawaiian genus *Apterocis*), and is represented by a single species, almost certainly endemic to the Seychelles. Taking the Seychelles species as a whole, more than half were found exclusively in the endemic forests at high elevations, and these insects are probably endemic; among the few species taken in cultivated places are the only forms (three in number) known to occur outside the islands.

The Seychelles Ciid fauna, with 6 genera and 19 species, is rich in comparison with that of some other islands, *e.g.* Madeira and the Canaries; this is doubtless partly due to the moist equatorial climate and luxuriant vegetation of the Seychelles. The Hawaiian Islands, however, have over 40 species of Ciidæ, but only 2 genera are represented. This type of contrast between the Hawaiian and Seychelles faunas holds good also in other families. It may be added, by the way, that in the British Islands 4 genera and about 20 species of Ciidæ occur.

Besides exhibiting in some cases unusual anatomical characters, the Seychelles Ciidæ are widely representative of the various types of secondary sexual characters for which the family is noted, and which usually consist in the development of horns or tubercles on the front of the head and prothorax in the male, or of other structural modifications of those parts.

The President, Dr. W. T. Calman, and Mr. Stanley Edwards congratulated the author on the admirable way in which he had made a somewhat special subject so generally interesting.

Mr. D. J. Matthews.—"Physical Oceanography of the Indian Ocean."

The material available consists of surface observations of salinity and temperature made in the Indian Ocean in H.M.S. 'Sealark' from July to November 1905 and in vessels of the mercantile marine at all times of the year, and of a number of serial temperature observations down to 200 fms. or more with a deep sounding, bottom temperature, and specimen of the bottom. A well-marked discontinuity layer occurs at nearly all the serial positions, and its presence appears to be independent of whether the station lies in the south equatorial current or not. It has been generally supposed that a strong surface-current drags up colder water so as to increase the differences of temperature. At

one position the current impinging on the bank north of the Farquhar Group at about 800 fathoms causes mixing at all depths, which lowers the temperature near the surface and increases it on the bottom by one degree Centigrade. The surface salinities are shown to be intimately connected with the currents and winds. The low salinity water which lies across the eastern entrance to the Gulf of Aden, and which at one time was supposed to be due to upwelling during the south-west monsoon, is present at all times, and is partly due to the current northwards along the east coast of Africa.

The President referred to the great variability of submarine conditions and its effect on plankton organisms.

Dr. Calman pointed out that to a large extent the geographical obstacles to the distribution of land animals were absent from the sea, the limiting factors there being temperature, salinity, and the like. He asked if any light had been thrown on the influence of the upwelling of deeper waters, as bringing up phosphates, on the growth of organisms in the mixture of superficial and deep waters. In reply, Mr. Matthews agreed that the mixture of the deep with the superficial water had an influence. He also referred to research carried out by himself at Plymouth that went to show the influence of light on the amount of phosphates available; generally speaking, the more light the less phosphates.

Mr. S. T. Burfield and Mr. E. J. W. Harvey.—"Chætognatha."

Of the 7 genera of Chætognatha 4 were found. Of *Sagitta*, which contains 22 or 23 species generally considered valid, 14 species are represented. Of the 32 valid species of the phylum 18 occur. The limitation of the number of species in the group is thus amply confirmed by this large collection. In the systematic part, tables are given showing the variation in the structural formulæ. The positions of *S. hispida* Conant and *S. robusta* Doncaster are elucidated by the large material and a re-examination of the types. *Eukrohnia richardi* is recorded for the second time. Part II. deals with the distribution and emphasizes the homogeneity of the Indo-Pacific region. The vertical distribution is essentially in agreement with the records of other expeditions.

Dr. C. J. van der Horst.—"Eupsammidæ."

The collections contain 18 species of the Eupsammidæ. There are seven species of *Dendrophyllia*, the form and colour-variations of which have been considered. After comparison with the original types, or photographs of the same, as well as with the 'Siboga' and other modern collections, 17 described species are grouped under *D. aurea*. There are 7 species of *Balanophyllia* and 1 each of *Endopachys*, *Rhizopsammia*, and *Stephanophyllia*. The collections of *Heteropsammia*, about 1000 coralla, are grouped in the two species, *H. michelini* and *H. cochlea*, the former from around the oceanic islands, the latter from the Ceylon area.

Prof. R. Douglas Laurie, M.A.—"Anomura from the West Indian Ocean."

The Anomura of the 'Sealark' Expedition were taken from localities between 3 and 21 degrees South latitude and between 51 and 73 degrees East longitude. They comprise 48 species distributed among the Tribes Hippidea (1), Galatheidea (24), and Paguridea (23). The collection presents a typical Indo-Pacific facies. A fair proportion of the species are, however, now recorded for the first time from localities so far west in the Indo-Pacific Ocean. Some are new to the Mascarene area. One, *Galathea integra* Benedict, is new to the Indo-Pacific region. Four of the species are described as new to Science, one of them belonging to the genus *Petrolisthes* and the other three to the genus *Galathea*. This Indo-Pacific collection offers, of course, a marked dissimilarity from the fauna of the tropical west coast of America and also from that of the Western African coast. It is interesting to note that the three species of the present collection which reach the western coast of America, namely *Petrolisthes lamarcki* (Leach), the deep-sea form *Parapagurus pilosimanus* Smith, and the land form *Cœnobita rugosus* H. M.-Edw., are three of the four which spread also to the Atlantic.

Mr. H. Britten.—"Coleoptera, Ptiliidæ [of the Seychelles]."

The Ptiliidæ (or Trichopterygidæ) are the smallest of all beetles, and the various species found in the Seychelles range in length from 0·5 to 0·9 millimetre. Thirteen species are enumerated from these islands, ten being described as new to Science. Particulars are given as to the habitats of several of the species; and the distribution in other parts of the world of the three which are known from outside the Seychelles is stated as far as it is known.

Mr. E. T. Browne, M.A., F.L.S.—"Siphonophora." [No abstract received.]

17th December, 1925.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 3rd December, 1925, having been circulated, were confirmed.

Mr. Thomas Bainbrigge Fletcher, Prof. William Thomas Gordon, Mr. Frederick Claude Stern, O.B.E., M.C., Dr. John Augustus Voelcker, Mr. Henry Goland Robinson, M.Sc., and Dr. Margaret Tribe were admitted Fellows.

The following certificates were read for the second time—as Fellows: Roland Oscar Iliffe, M.A., and Sushil Kumar Mukerji, M.Sc.; as an Associate: Morley Benjamin Crane.

A ballot for the undermentioned was held, and they were elected Fellows:—John McDonald, B.Sc., Miss Maud Williams, B.Sc., The Rev. Charles Herbert Binstead, M.A., and Prof. Francis Ernest Lloyd.

Mr. J. H. Owen, of Felsted, sent for exhibition a specimen of *Typha latifolia* in which two inflorescences adhered at their upper portions; the President undertook to examine the specimen.

Dr. H. Graham Cannon gave an account, illustrated with a series of lantern-slides, of his paper "On the Feeding Mechanism of the Freshwater Ostracod, *Pionocypris vidua* (O. F. Müll.)."

The shell-cavity of *Pionocypris vidua* is incompletely divided into an anterior and a posterior chamber by the large "oral mass" consisting of the labrum and hypostome, that is suspended from the more dorsal parts of the valves. The mouth-entrance is on a level with the ventral edges of the shell. A stream of water is caused to pass antero-posteriorly through the shell by three vibratory plates, the most important of which occurs on the maxillule and oscillates in the posterior chamber of the shell-cavity. *Pionocypris vidua* is essentially a crawling form, and feeds on anything that it happens to kick up in its wanderings. The disturbed particles are sucked in by the water stream, caught on the tips of the mandibular palps, and passed backwards on to the maxillules. They here become entangled in a viscid secretion presumably from the labral glands, and the mass so formed is deposited by the maxillule at the entrance to the mouth. This is then transferred on to the mandibles and so into the œsophagus by a pair of "food rakes" that occur in the posterior wall of the oral cavity.

Dr. W. T. Calman remarked that Dr. Cannon's drawings showed the form of the body and the attachment of the limbs more clearly than any hitherto published. He also commented on the fact that, like many other animals which feed on detritus, these Ostracods were now shown to make use of a viscid secretion for capturing food-particles.

Prof. R. R. Gates gave an account of his recent visit to South America entitled "The Vegetation of the Amazon Basin," which was illustrated by an extensive series of lantern-slides.

The whole of the Lower and Middle Amazon basin, from the Atlantic to the Andes, lies within a few degrees of the equator and represents the greatest area of forest in the world. Practically the whole region is clothed with luxuriant tropical rain-forest, but little altered by the hand of man. The largest unexplored areas in the world are to be found there.

In many features the Amazon is unique. It far surpasses any other river in its drainage-area and in the volume of water discharged, the main channel being 40 to 60 fathoms deep up to Manaos (1000 miles). At high river, in June, the water-level

is in many places over 50 feet above its level at the end of the "dry" season. As the river rises, thousands of square miles of forest-country are inundated, often many feet deep. This is known as *igapo*, and the annual flooding has striking effects on the vegetation. Large areas of coarse grasses, called *canarana* (chiefly species of *Panicum* and *Paspalum*), often occur along the river-margin. These have rhizomes half an inch in diameter, which root in the mud and grow out into the river. As it rises they float on the surface, while masses are torn loose from their moorings by the floods and float down the river as green carpets of vegetation.

Another interesting plant on the river's edge is *aninga* (*Montrichardia linifera*), an Aroid whose stems form a striking palisade, rooting in the mud. Of ecological interest is a formation called *œirana*. This consists of *Salix Martiana* and *Alchornea castaneifolia*, often intermingled. They are small trees usually forming a river-fringe, often with areas of *canarana* behind them. The willow has small, light green leaves, and the *Alchornea* is so much like it in habit that the two are indistinguishable at a short distance, even through glasses, although the latter belongs to the Euphorbiaceæ.

Among floating plants, several species of *Eichhornia* are common, sometimes flowering in masses in sheltered lagoons. Utricularias are found in similar situations, as well as *Salvinia*, *Azolla*, and *Lemna* spp. *Victoria regia* also spreads its leaves in sheltered lagoons, and late in the season is apt to be overgrown by *canarana*.

Another characteristic plant along the river is a gigantic "pampas" grass (*Gynerium sagittatum*), called *flexa* in Portuguese, because the upper part of the stalk is used to make arrows for shooting the turtles which abound everywhere and constitute the only meat available during several months of the year. In many places *imbauba* (*Cecropia palmata* and other species) is common. This is a small tree, or even shrub, on the forest-margin. Its digitate leaves have a coat of wax underneath and are a favourite food of the sloths. Small fine-leaved bamboos of many species occur in some places. They are called *tabocá*. Another characteristic tree of the river's brink, which evidently likes to have its trunk submerged, is the *mungubeira* (*Bombax Munguba*). It drops its leaves while maturing its fruits. The bare whitish branches hung over with large brick-red fruits make a striking sight. The silk-cotton tree or *sumahuma* (*Ceiba pentandra*), another member of the Bombacaceæ—the giant of the Amazon jungles,—has the same habit. It would be very interesting to make a study of annual growth-rings under these conditions.

Interesting in another way is the *tachi* (*Triplaris surinamensis*), a tall myrmecophilous tree belonging to the Polygonaceæ. Its abundant flowers made a great show on the river in July and August. A blow on the trunk brings down a shower of ants. Innumerable other trees, such as the *mulateiro* (*Calycophyllum Spruceanum*), so called from the bright brown colour of its bark,

are of commercial or botanical importance. On the Rio Negro, *pau mulato* is chiefly burned as fuel by the river-steamers. Woods which might be used commercially are too numerous to consider.

The two most numerous families in the forest are the Cæsalpinioideæ and the Palms. Among the most conspicuous palms are the *carnauba* (*Copernicia cerifera*) on dry land away from the river, *mirity* (*Mauritia flexuosa*), *pachiuba* (*Iriartea exorrhiza*), *assai* (*Euterpe* spp.), *bacába* (*Œnocarpus* spp.), *caiaue* (*Elœis melanococca*), *urucury* (*Attalea excelsa*), royal palm (*Maximiliana regia*), *mucajá* (*Acrocomia*), *tucuma* (*Astrocaryum* spp.), *murumuru* (*A. Murumuru*), *jauary* (*A. Jauary*), *marajá* (*Bactris* spp.), *pupunha* (*Guilielma speciosa*), *jacitara* (*Desmoncus*), and *jarina* (*Phytelephas*).

The President congratulated Professor Gates on the excellent use he had made of the short time at his disposal in the Amazon valley.

Mr. T. A. Sprague remarked that the *Igapo* vegetation was pretty much alike in all parts of Tropical America. He referred also to the existence of extensive savannahs, and commented on the great number of species of plants in the virgin forest behind the *Igapo*. He recalled Spruce's explanation of the origin of the grass islands in the river as being formed in lakes. The lakes silt up during the dry weather, and then, when the next rainy season brings its floods, large fragments of the silted mass are broken off and carried ultimately into the river.

Dr. J. M. Dalziel stated that similar conditions to those on the Amazon occurred on the Niger, but to a less extent. The difference between high and low river was often forty feet, but the depth of inundation of the forest was less than on the Amazon, and the period during which the forest floor was under water was probably much less. Scitamineæ were predominant in such situations. A closer comparison with the Amazon would be possible in parts of the Congo or the Gaboon or Ogowe rivers, which were entirely equatorial. *Ceiba pentandra* was a feature both of forest and savannah in West Africa, and a giant in both situations. Although commonly deciduous, at time of fruiting it showed a peculiarity in the forest, for there, at the same time, might be seen trees bare of leaves and shedding their fruit, trees in foliage with flowers, and trees for the most part in foliage but also bearing bursting fruits. Observation showed that in some circumstances *C. pentandra* was deciduous in parts only. The formation of floating islands of sudd in the Niger resembled that in the Amazon. Large masses of grass, chiefly *Panicum stagninum*, along with *Pistia* etc., are detached from vast temporary lakes and marshes adjoining the main river. These islands might be of considerable size and may be observed on the coast, after they had crossed the river bar. Viewed from a ship, the surface of such an island was seen to be alive with insect life (Orthoptera and Hymenoptera), with sometimes small birds, grass warblers, etc.

Although such floating sudd islands on the West African coast with its heavy surf were not likely to reach another shore, they might, under other circumstances, be of considerable interest to zoologists.

Mr. E. G. Baker and Lt.-Col. A. T. Gage contributed further remarks.

7th JANUARY, 1926.

Dr. A. B. RENDLE, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 17th December, 1925, having been circulated, were confirmed.

The PRESIDENT read the following letter, all present rising in their places :—

Home Office,
Whitehall,
24th December, 1925.

SIR,

I am directed by the Secretary of State to inform you that the loyal and dutiful Address of the Linnean Society of London on the occasion of the lamented death of Her late Majesty Queen Alexandra has been laid before The King, who has commanded the Secretary of State to convey to you His Majesty's thanks for this expression of their sympathy.

I am,
Sir,
Your obedient Servant,
(Signed) A. J. EAGLESTON.

The Secretary,
Linnean Society of London,
Burlington House,
Piccadilly, W.1.

Mr. John Everard Hosking, Mr. James Levi Sager, Mr. Alfred Reginald Stephenson Proctor, Mr. Arthur Hugh Batten-Pooll, V.C., M.C., Mr. Ashley Gordon Lowndes, M.A.(Cantab.), Miss Maud Williams, B.Sc., Mr. Harold Augustus Hyde, M.A.(Cantab.), and Mr. Bertram Henry Buxton were admitted Fellows.

Dr. Suresh Chandra Ray, F.Z.S., and Mr. David Joseph Scourfield, I.S.O., F.Z.S., F.R.M.S., were proposed as Fellows.

A ballot for the undermentioned was held, and they were elected—as Fellows: Mr. Roland Oscar Iliffe, M.A.(Cantab.), and Mr. Sushil Kumar Mukerji, M.Sc.; as an Associate: Mr. Morley Benjamin Crane.

Mr. E. Heron-Allen, F.R.S., exhibited specimens and lantern-slides of an abnormal *Auricula*, in which normal flowers had been replaced by clusters of bracts. The President took charge of the specimens in order to have them examined.

Mr. E. J. Collins commented on the nature of the monstrosity, and pointed out that the development of bracts and excessive growth of the calices of individual flowers occur in a form of *Primula*, known to the trade as "Jack-in-the-Green," which possesses foliaceous sepals.

Mr. E. M. Marsden-Jones gave an account, illustrated with lantern-slides, of his paper "On the Fertilization of *Primula vulgaris* Huds.," of which the following is a summary.

The arguments in favour of the pollination of *Primula vulgaris* by unknown nocturnal Lepidoptera gave rise to this paper. Observations were made by day and night in a wood at Potterne in Wiltshire in order to ascertain with the greatest degree of accuracy the part that day- and night-flying insects might play in the pollination of the plant. A series of systematic observations were made by day, between April 8th and May 15th, 1925. The length of time spent in observing was in all 12½ hours, and the number of important species of insects seen pollinating frequently was five. They comprise *Bombus hortorum*; *Anthophora pilipes*, ♂ and ♀; *Bombylius major*, ♂ and ♀; *Bombylius discolor*, ♂ and ♀; *Rhingia campestris*, ♂ and ♀. All these have a proboscis long enough to pollinate.

The night observations extended from April 9th to May 15th, 1925. Fifteen visits were paid to the wood at various hours, covering the entire night from 8.15 P.M. to 4.40 A.M. The time spent was 16 hours 20 minutes, and the only visitors seen were *Meligethes erythropus*, *Tachyporus solutus*, and *Forficula auricularia*, which are of no value from a pollinating point of view.

Besides these direct observations a control experiment was also carried out. Two blocks of 50 plants each were covered alternately day and night.

The patch from which insects were excluded at night produced 343 capsules, while the one exposed by night, and from which day-flying insects were excluded, produced only 5, for which there is an explanation. This experiment lasted from April 19th to May 23rd. A further control experiment was carried out, six plants being covered entirely day and night; these proved to be absolutely sterile.

The conclusions drawn from the direct and experimental evidence prove that diurnal insects do pollinate efficiently, and that nocturnal Lepidoptera play no part whatever in the pollination of *Primula vulgaris*.

The President and Mr. Miller Christy congratulated Mr. Marsden-Jones on his methods and results. Mr. Miller Christy, while he accepted it as proved that nocturnal moths are not concerned in the pollination of *Primula vulgaris*, expressed himself as not

entirely satisfied that diurnal insects alone are sufficient to account for the pollination of the total mass of *Primula vulgaris* that flowered in a season.

Mr. M. A. C. Hinton exhibited a series of lantern-slides illustrating "Persistent Growth" in the Water-Vole and Old Age in the Wart-Hog.

The exhibition was intended to be a contribution to the discussion on "Growth and Death" introduced by Dr. Bidder in February 1925.

The ancestors of the Voles resembled the more generalized Muridæ in possessing tuberculate teeth of limited growth adapted for bruising and crushing the relatively soft and succulent substances composing a mixed diet. In such rodents a natural term is put to the life of the individual, because the molar crowns are eventually worn away by use and the animal must then perish.

Under the stress of competition the Voles have gradually forsaken the luxurious fare of their ancestors and rivals. They have acquired the power of subsisting upon coarse, tough, vegetable substances despised by the great majority of their relations. This change of diet has led to great modifications of bodily structure, and of these some of the most striking are seen in the molar teeth. These have become tall-crowned, prismatic structures adapted for slicing and shearing the food; and to compensate for the unusually rapid attrition of the molar crowns which must follow from the mastication of a hard diet, the dentinal pulps and enamel organs of the teeth have acquired by degrees the remarkable power of remaining active apparently throughout life, so that continuous waste of tooth substance from the grinding surfaces is repaired by continuous growth at the bases of the molars. A series of forms belonging to the genera *Mimomys* and *Arvicola* shows the course of evolution, along the lines above described, which has taken place in a single Microtine phylum between the Upper Pliocene period and the present day.

The Water-Vole (*Arvicola amphibius*), like other highly specialized Microtinæ, is remarkable in another way. In the oldest individual known, selected from many hundreds of recent specimens and thousands of fossils, not only were the molar teeth actively growing at the moment of death but the skeletal development was still incomplete. This is apparent in the skull, but more obvious in the limb skeleton, in which the epiphyses are still unfused with the shafts of the long bones. Such old Water-Voles, although centenarians in comparison with the average adults of our collections, are, nevertheless, in full vigour; and, so far as actual observation is concerned, cross-examination would force us to admit that the Water-Vole and some of its relations are mammals which apparently never stop growing and never grow old.

In another order, however, the Wart-Hog teaches us to be cautious in dealing with non-stop Voles. In that animal, as is well known, the last molar in each jaw is an enormous tooth

which moves into place from behind forwards, like the grinders of an Elephant, making room for itself in the jaw by pushing out the worn stumps of all the anterior cheek-teeth. In the literature both this last molar and the enormous canines of the Wart-Hog are described as being persistently growing teeth. But recently-acquired material shows that, if the Wart-Hog lives long enough, its last molars and canines finish growing, develop roots, and wear out, so that in due course the animal becomes senile and dies. And this leads me to think that if we could secretly defend a Water-Vole from the fatal stroke of accident indefinitely and continue ostensibly to expose it to all the perils and hardships that constitute normal Microtine existence, a time would come when its growth would cease, and the Vole would then proceed to old age and death like a normal mammal.

The President read a letter from Dr. Bidder—who was unable to be present at the meeting—in which he said :—" Mr. Hinton's two observations do not seem to qualify each other. My working hypothesis of senility is that, shortly after puberty, an inhibitory endocrine is secreted (possibly in vertebrates by the pineal gland), so as to check growth when the animal has attained approximately its specific size, and thus to prevent it attaining proportions which in an animal not water-borne would be fatal. The inhibitory influence which arrests growth produces an apparently stationary period in the prime of life, which careful analysis shows to be really a period of slow growth and of slow diminution ; but when growth is finally extinguished, the balance set is one of steady diminution in the protein contents of all the cells of the body.

"We have long known that in vertebrates of specific size, growth continues through life in certain tissues, such as the rodent incisors and the hair, nails, and skin of mammals generally. It is probable, however, that in all such cases growth, though life-long, is not constant, but subject to the senile diminution with which we are all acquainted in the human hair, and which Mr. Hinton has now proved in the molars of the Wart-Hog . . . . .

" But if in the water-borne Vole there is no inhibitory endocrine secreted there is no question of greater or less resistance to the inhibition, and there is nothing to prevent the tissues growing continuously. If this view be right, then if Water-Voles were kept continuously in healthy protection they would never reach a specific size, but die eventually, not of senility, but of its antithesis—disproportion."

Prof. E. W. MacBride, F.R.S., pointed out that growth of teeth was not necessarily confined to the roots, but might also be—as in the Horse—interstitial.

Sir S. F. Harmer, K.B.E., F.R.S., congratulated Mr. Hinton on his very interesting exhibition, but was sceptical of Water-Voles growing indefinitely. He emphasized the value—as shown by Mr. Hinton's research—of long series of specimens.

Mr. Oldfield Thomas, F.R.S. (Visitor), commented on certain aspects of Mr. Hinton's remarks, from the point of view of one who had described numerous new species.

Lt.-Col. J. H. Tull Walsh expressed himself as unable to accept Dr. Bidder's attribution of an inhibitory effect to the endocrine glands, and more particularly the pineal. The pituitary gland controlled growth during youth, but thereafter its effect was associated with that of the thyroid.

Major S. S. Flower stated that the African Wart-Hog, *Phacochœrus*, from experience in zoological gardens in England, America, and Egypt, was known to live for 12 to 13 years, and exceptionally to 16½ years. The African Bush-Pig (*Potamochœrus*), the Celebes *Babirusa*, and the American *Pecari* were also known to live from 12 to nearly 15 years. In fact, their length of life seemed to be about the same as the ordinary *Sus scrofa*, wild or domestic, which seldom exceeded 15 years and of which the longest records known to him were 17½ and 19½ years.

Mr. A. T. Hopwood remarked that the Toxodonts formed a case almost intermediate between the two examples given by Mr. Hinton. The epiphyses, as in the Wart-Hog, early fused to their shafts, while the teeth, so far as was known, never formed roots, agreeing in this respect with the Water-Voles. From mechanical considerations the fusion of shaft with epiphysis was to be expected, for the great weight of the body necessitated solidity in the pillar-like limbs. So far as the teeth were concerned, there did not seem to be any reason for the later Toxodonts ever dying.

Mr. R. H. Burne offered some criticisms, and Mr. A. J. Wilmott questioned whether evidence of senility in one particular part of an organism necessarily involved attributing senility to the organism in general, and he instanced the case of loss of hair in men who were still quite young.

Professor F. Wood-Jones, D.Sc., F.R.S., gave a brief account of the Fauna and Flora reserve on Kangaroo Island, South Australia. This Reserve—known as Flinders Chase—comprises some 200 square miles at the western end of the island. It was set aside as a sanctuary by the Government of South Australia by Act of Parliament in 1919. The administration of the Reserve is carried out by a small Board, of which Professor Wood-Jones is the honorary secretary. The work carried on by the Board was outlined and some account of the Fauna and Flora was given. Funds for the Chase have to be raised by the Board, and on all moneys collected the Government grants a pound for pound subsidy. It is intended that the Reserve shall function, not only as a sanctuary, but as a depot for the legitimate supply of scientific material to workers in Australia and other lands, and for the furnishing of living animals to zoological gardens, specimens to museums, and pelts to the fur market. In this way the Board is confident that ample revenue can be raised for much needed work upon the Chase, and granted

a continuance of public goodwill and proper political support, it may be safely predicted that Flinders Chase will rank among the important sanctuaries of the world, and be a cherished possession of South Australia when the terrible depletion of the indigenous Fauna and Flora, which is proceeding on the mainland, has robbed Australia of its unique zoological and botanical interest. Considerable progress has already been made in the direction of introducing on the Chase those species which are in most immediate danger of extermination in continental Australia, and this policy will be steadily continued so far as opportunity and funds permit. A series of lantern-slides illustrating the topography and some of the animals and plants of the Chase was shown.

Remarks by the President and Dr. A. W. Hill, F.R.S., led to the following Resolution being unanimously adopted:—

> "That the Linnean Society in General Meeting assembled having heard with great interest and pleasure the account by Prof. Wood-Jones of the Flinders Chase Reserve on Kangaroo Island, desire to express their appreciation of the work which is being done for the preservation of this portion of the South Australian Fauna and Flora."

21st January, 1926.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 7th January, 1926, having been circulated, were confirmed.

Certificates in favour of Dr. Suresh Chandra Ray, F.Z.S., and Mr. David Joseph Scourfield, I.S.O., F.Z.S., F.R.M.S., were read for the second time.

The President exhibited a section of the female flower-bud of *Rafflesia Arnoldi*.

Professor H. B. Fantham, M.A., D.Sc., and Dr. Annie Porter, D.Sc., F.L.S., exhibited preparations of, and made remarks upon, two species of Herpetomonads found respectively in the latex of *Euphorbia striata* and *Ficus edulis* in Johannesburg, South Africa. The flagellate parasite in the latex of *E. striata* is considered to be probably a strain of *Herpetomonas* (*Leptomonas*) *davidi*, and that found in *F. edulis* is regarded as a new species.

The plants parasitized did not show any marked pathological symptoms, though plants so parasitized in other parts of the world—especially in the Tropics—may show wilting and loss of chlorophyll. Only certain parts of the plants, such as branches and leaves, were affected, the infection being localized. The number of infected plants was very small in each case.

The possible source of the Herpetomonads is of interest. They are best known as parasites of the alimentary tract of insects, both blood-sucking and non-blood-sucking. Marks of punctures, very probably made by the proboscides of plant-feeding Hemiptera, were seen on the *Euphorbia*, while green flies, *Lucilia* sp., were found on the fig-leaves. In Portugal and Central America it has been definitely stated that the Leptomonads found in the latex of various orders of laticiferous plants are those of plant-feeding bugs, and are inoculated by the latter into the latex of the plants. The exhibitors have also found them in the soil. The flagellates also occur in the alimentary tract and blood of certain vertebrates, such as fish, reptiles, and birds, and in Man and dogs under the name of *Leishmania kala-azar*, and skin-sores are caused by them. It is interesting to find the latex of certain plants forming a natural reserve of Herpetomonads.

In reply to questions put by Sir Sidney Harmer, Dr. H. G. Cannon, Dr. E. M. Delf, and Dr. E. J. Salisbury, the authors stated that, although the plants did not appear to be diseased, some infected plants, more particularly in the Tropics, showed symptoms of disease. The flagellates were limited to the latex. The localization of infection could be explained by the flagellates remaining in the neighbourhood of the punctures made by insects. Some tropical plants showed heavy general infection. The flagellates multiplied by longitudinal division. According to Professor Franchini, true Trypanosomes occurred in certain plants.

Dr. H. Hamshaw Thomas opened a discussion on the relation between the Caytoniales and modern Flowering Plants.

[Abstract of Dr. H. H. Thomas's remarks]:—

The comparative study of the Flowering Plants having led to discordant conclusions as to their origin and early development, it is desirable to study all fossil plants which may provide evidence on these questions. The recently-described Caytoniales are of some interest because they were Angiosperms without flowers, their reproductive structures being megasporophylls bearing carpels and microsporophylls bearing anthers. These sporophylls may have been borne on separate plants, and the grounds on which they are associated in one group seem reasonable though not finally conclusive. A single carpel and a single anther of this fossil type can be compared somewhat closely with the corresponding structures in the modern flower; they are much more comparable than any previously-described fossil forms, and they belong to a period (Middle Jurassic) in which the appearance of early angiosperms would be expected. It is unlikely that the Caytoniales represent the direct ancestors of the Flowering Plants, but they may be derived from the same stock which gave rise to that group; thus a study of their morphology may indicate those characters in the modern Angiosperms which are to be regarded as primitive.

The structures described as carpels in *Gristhorpia* and *Caytonia* were certainly closed at an early stage, and had stigmas upon which pollen-grains are found. They were carpels in the physiological sense, though the use of this term has been criticized on morphological grounds. The author holds the view that De Candolle originally employed the term carpel for the closed ovary with style and stigma characteristic of the angiospermous flower, representing either a complete fertile leaf or a fertile leaflet, the petiole of which might be still recognizable. The later custom of regarding the term carpel as synonymous with megasporophyll and extending its use to the gymnosperms is unjustifiable.

In spite of the great difference between the carpel of a *Caytonia* and that of an apocarpous Flowering Plant, some correlation may be attempted. The crowding together of sporophylls into an inflorescence or flower might lead to a reduction in the number of fertile segments, and to the suppression of all but a terminal carpel on a short stalk or gynophore. Or it might lead to the suppression of all but the terminal pair of carpels and the fusion of these into one structure; in this case we should have a structure with two vascular strands, two double rows of ovules, and an apical stigma perhaps with two lobes. This is somewhat like the form once suggested by Wettstein as the primitive carpel. If any modern carpel represents only one of the *Caytonia* carpels, the stigma must have become shifted from the basal to the apical end, and the development of the fruit in *Tetracentron sinense* and some Menispermaceæ lends colour to the suggestion. Assuming some relationship, the structure of *Caytonia* points to the carpels of the primitive Angiosperms having double rows of ovules produced in a dorsal median position near the vascular strands, rather than to the occurrence of marginal ovules produced on the sides farthest away from the vascular strands. This seems to confirm the important views put forward by Miss E. R. Saunders as to the primitive structure of the solid and semi-solid carpels. While possessing distinct papillate stigmas, *Caytonia* and *Gristhorpia* had no styles, and thus support the view that the absence of a style is a primitive feature.

Caytonia and *Gristhorpia* were undoubtedly wind-pollinated, and contained many ovules in each carpel. They can therefore be cited in opposition to the views (Robertson) that the primitive Angiosperms were insect-pollinated; and that the occurrence of many ovules in the carpel of a modern anemophilus flower is an indication of its recent derivation from an entomophilous form. The views (Hallier and Senn) that primitive angiosperms had many orthotropous ovules giving seeds of simple structure inside a fleshy fruit are supported, but the seeds of the Caytoniales are small in size and do not agree with the view that the primitive Angiosperm seeds were large like those of *Cycas*.

The comparison of the micro-sporophylls (*Antholitus Arberi*) with the modern stamens may indicate that the primitive anther

had four equal pollen-sacs arranged longitudinally, and was inserted by its base on the filament. There are indications of thickened hypodermal cells and longitudinal dehiscence in this fossil form. Hallier's view that the primitive stamen showed little differentiation into filament and connective, but was a leaf-like organ bearing sporangia on its surface or edge, seems to be somewhat incorrect, for the whole differentiated anther was here borne on the margin of the sporophyll. As in the case of the megasporophylls, we have in our fossil a large number of anthers borne in groups on a leaf-like structure, but here there are indications that the number was variable. Is it reasonable to suppose that the modern stamen represents such a sporophyll with its anthers reduced until only one is present?

The arrangement of the anthers in groups may be of importance in connection with the interpretation of the branched stamens of *Ricinus*, some of the Guttiferæ, Malvaceæ, and other plants. It is possible that in some cases branching stamens are primitive, and the types just mentioned may be worth re-investigating, together with such forms as the male flowers of *Pandanus* and other cases where stamens are produced in an indefinite bunch.

The Caytoniales supply no definite evidence as to the characters of the primitive flowers or inflorescences; their sporophylls were probably borne at considerable intervals on slender stems, and no traces of bracts or perianth leaves are found with them. However, it requires no great morphological assumption to imagine that in some allied form they were more closely aggregated. At first sight a sporophyll suggests a comparison with an amentum, but we must note that the stalk of the mega- and micro-sporophylls is probably a foliar and not a cauline structure. Even though they become crowded together on a branch with a reduction of the numbers of carpels and stamens, we should not get a catkin like that of *Salix* or *Populus*, because there would be no bracts. Nevertheless, some of the modern groups with simple unisexual flowers may have arisen independently from the stock which also gave rise to the Caytoniales.

A second and more plausible view brings the Bennettitales once more into the argument. The seed-structure of *Caytonia* suggests a somewhat distant relationship with the Bennettitales, probably through a common group of Pteridosperm ancestors. The sporophylls of the Bennettitales are very unlike the stamens and carpels of the modern flower, but their arrangement in a bisexual strobilus is comparable with that seen in the Polycarpicæ. The reproductive structures of the Caytoniales are like those of the modern flowers, but they do not show a strobilar arrangement. May we not consider that some other group of plants, also derived from the Pteridosperms, existed in Mesozoic times, which resembled the Caytoniales in the structure of their sporophylls and the Bennettitales in the mode of production of their sporophylls? From such a group many of the modern

flowering plants may have been derived. But if we may consider that the Caytoniales and the Flowering Plants sprang from a common ancestor which had already evolved the carpel and anther, there is no reason why some of the Amentiflorae and Polycarpicæ should not have evolved along distinct lines from such an ancestor.

We know nothing of the habit of the fossil plants which bore the reproductive structures which have been described, but it is probable that their leaves have been identified. The somewhat variable forms long known as *Sagenopteris Phillipsi* are referred to Caytoniales on the evidence of association and of similarities in the character of the epidermal cells in the petioles and sporophylls. The characters of the *Sagenopteris* leaf are such as we might expect to find in an early Angiosperm. It generally has a petiole bearing four leaflets in a palmate manner, but sometimes trifoliate or simple forms are found, while the normal arrangement may be derived from a type which was pinnate like the sporophylls. The leaflets are sometimes reduced, and the petiole has winged expansions of assimilating tissue, so approaching a phyllode. The nervation of the leaflets shows a series of closed meshes formed by the anastomosis of veins which spring from an inconstant midrib. There are, however, no fine veins ending blindly within the meshes. Now, leaves with a venation of this character, the normal type of dicotyledonous venation, may have evolved in a way similar to that seen in the ferns. Many other leaves have been found in the Lower Cretaceous rocks of America which are much more modern in their general appearance, but which have a venation with small closed meshes that can be compared with *Sagenopteris*.

The Caytoniales were probably widely distributed throughout the world in Mesozoic times. Species of *Sagenopteris* occur in both hemispheres, and range from Greenland to Grahamsland. The reproductive structures originally found in Yorkshire have now been detected in Greenland, and will probably turn up wherever the *Sagenopteris* leaves are abundant. These discoveries tend to show that the Angiosperms originated at a much earlier period than was formerly supposed, and that at least one group of early Angiosperms achieved a very wide distribution in early Mesozoic times.

[Discussion on the relation between Caytoniales and modern Flowering Plants]:—

The President, in congratulating Dr. Thomas on the interest and importance of his work, referred to the remarkable technique by means of which so much anatomical detail had been elucidated.

Dr. D. H. Scott said that Dr. Thomas's remark, that his fossils are "Angiosperms without flowers," was identical with Van Tieghem's well-known saying, that the Pteridosperms are "Phanerogams without flowers." The identity of the two statements was significant.

We were told that the female fructification of the Caytoniales was a megasporophyll, a single fertile leaf bearing closed "carpels." We might accept the megasporophyll interpretation, though it was not the original one. At first, Dr. Thomas had regarded the fruit-bearing organ as an axis bearing the fruits on its branches, like a bunch of currants. The speaker was reconciled to the new megasporophyll view, chiefly on the ground of analogy with the stamens described, for they were evidently compound sporophylls, bearing anthers.

Dr. Thomas used the word "carpel" in a sense of his own, for he made the megasporophyll bear quite a lot of carpels, whereas the rest of us regarded a megasporophyll and a carpel as one and the same thing. Dr. Thomas thought this use of the word "carpel" and its extension to Gymnosperms "unjustifiable."

The speaker had consulted a number of definitions by recognized authorities, and found that they all agreed in calling the carpel a *leaf*, often explicitly terming it a megasporophyll and extending its use to Gymnosperms. So, for example, Dr. Daydon Jackson, to whose Glossary we all turned first. His definition was: "A simple pistil or element of a compound pistil, answering to a single leaf; a female sporophyll." Chodat (Principes de Botanique, p. 588, 1911) puts it very clearly: "On appelle *carpelles* les mégasporophylles des spermaphytes."

The necessarily difficult and obscure case of the Caytoniales was not a sufficient ground for changing the established use of a familiar term.

Dr. Thomas had suggested a reduction in the number of fertile segments of the megasporophyll until we arrived at the single-leaved carpel of Flowering Plants. This would make the carpel, as we now know it in Angiosperms, a *reduced* megasporophyll, but still a megasporophyll, just as the stamen is a microsporophyll, though very probably a reduced one.

The Caytonial female fructification, if a megasporophyll, was totally unlike that of any known Angiosperm, and rather suggested some peculiar form of Cycad. The late Dr. Krasser had described some remarkable fossil fructifications, referred to Cycads, from the Trias of Lunz. Dr. Thomas knew them well. Among them was *Haitingeria*, described as a deeply pinnatifid sporophyll, bearing numerous seeds on the edges of the segments. Was it possible that some such form, with the edges of the segments rolled in to enclose the seeds (as the sporangia are enclosed in the Ostrich Fern), might have given rise to the Caytonial type of megasporophyll?

There was no doubt of the importance of Dr. Thomas's discovery. He had proved the existence, in Jurassic times, of a race of plants with angiospermous fruits, long before the earliest previous record of Angiosperms. As the author had himself pointed out, we could, at present, only conjecture the possible relations of his new group to the main lines of descent.

Prof. F. W. Oliver, referring to the *Sagenopteris* type of leaf, thought there was no inherent objection to accepting as an archaic Angiosperm a plant with a type of foliage more appropriate to a lower status—provided always that the evidence for allocation were good. As Arber and others had pointed out, reproductive and vegetative evolutionary advance did not necessarily go hand in hand, and a plant might rise in the reproductive scale whilst still retaining its ancestral foliage. He agreed that in cases like the present it was good tactics to scrutinize closely the relations to the Pteridosperms, in view of their great richness in the pre-Mesozoic flora, their diversity of form, and wide geographical range. If the result was not very useful in the present instance, it was probably due to the refractory nature of the preservation in *Caytonia* and *Gristhorpia*. He had not been impressed with the case for associating at all closely these new seeds with types like *Gnetopsis* or *Conostoma*.

Miss Saunders remarked that the chief grounds put forward by Dr. Thomas for suggesting a relationship between the Caytoniales and the Angiosperms related to the characters of the megasporophyll. That in this connection she thought the application of the term *carpel* to the seed-containing structures borne on the megasporophyll unfortunate. The term carpel, invented by Dunal, had a purely morphological significance which was quite precise. So far as she was aware, no other meaning had ever been attached to it during the century in which it had been in use than that of a modified leaf, and in view of the reiterated statements in more than one of de Candolle's works, notably the 'Traité élémentaire,' that the carpel was analogous to a leaf, she did not think Dr. Thomas's unusual use of the word to imply an individual leaf pinna could be sustained by appeal to this author. On the other hand, if it were desired to emphasize the similarity of the Caytonian seed-containing structure with the corresponding organ in the Angiosperm, she thought the term ovary could much more suitably have been employed. But, terminology apart, it was obviously desirable, if it were sought to establish a direct relationship between these seed-containing structures on the megasporophyll and the ovary of the modern Angiosperm, that we should have a clear conception of the latter structure. If we confined ourselves to the old idea of a monomorphic carpel, a carpel more or less like a leaf with a midrib and perhaps a system of lateral veins, with a stigmatic area centred over the midrib and a row of ovules down each margin, then we had nothing very comparable with the organs in the Caytoniales. But if we accepted the view which she had put forward, for which she thought there was already incontestable evidence, that the carpel had in the course of evolution become polymorphic, that in addition to the traditional valve or hollow type there had arisen the consolidated type with ovules in rows close to and on either side of the midrib, then it was clear that we had in the Angiosperm ovary a structure showing a very interesting analogy with the Caytoniales. Whether

anything more than an analogy could be claimed on the present evidence seemed very doubtful.

Mr. John Parkin did not consider that the Caytoniales were connected with the modern seed plants, which he preferred to derive directly from the Bennettitean stock. He also deprecated the comparison of the "anther" of *Gristhorpia* with the modern anther, which he preferred to derive from an organ bearing pollen-sacs laterally on a connective, as in Magnoliaceæ, e. g. *Liriodendron*.

Mr. T. A. Sprague explained the discordance in the phylogenetic conclusions reached as a result of study of the recent Angiosperms by the fact that present systems of classification were still far from being natural. The genera and families were largely natural, but most of the orders and higher groups were artificial.

Mr. H. N. Ridley said that when he first saw the male portion of *Caytonia* he was reminded of *Pandanus*, and it was of interest that the pollen of an allied genus, *Sararanga* Hemsl., was winged.

Dr. E. J. Salisbury expressed the view that, even if the Caytoniales were really related to the Angiosperms, a suggestion which was based on slender support, there seemed no justification for the assumption that the features of the Caytoniales were unspecialized, and therefore represented the condition in the primitive Angiosperm. To mention but one feature, the basal stigma, this had been compared with that of *Tetracentron*, but the ontogeny in the latter showed the basal stigma to be a specialization, and the same may well have been the case in *Caytonia* and *Gristhorpia*.

Mr. A. J. Wilmott suggested that at the time when the tendency towards enclosing the ovules began, which by involution of the whole sporophyll led to the carpel, one might expect to find variations in which ovules on each pinnule were enclosed separately, and that, if this occurred circinately instead of involutely, it might lead to a "basal" stigma.

The President commented especially on the absence of any trace of an embryo which characterized alike the "seeds" of Caytoniales and Pteridosperms, and implied an important difference between these structures and the seed of the modern seed-plant. He had been rather surprised to hear Prof. Oliver's refusal to admit a similarity between the seeds of Caytoniales and Pteridosperms. There seemed to be little in common between these Jurassic Angiosperms and the modern group of Flowering Plants.

Dr. H. H. Thomas briefly replied.

4th February, 1926.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 21st January, 1926, having been circulated, were confirmed.

Dr. Frederick Merlin Haines, B.Sc., Ph.D. (Lond.), Miss Mary Florence Rich, M.A.(Dubl.), Dr. Nellie Carter, D.Sc.(Birm.), Norman Boyd Kinnear, Miss Helen Mary England, M.Sc., Richard Waterfield, B.A.(Oxon.), Philip James Barraud, F.Z.S., F.E.S., Miss Eva Jennie Fry, M.Sc.(Wales), Dr. Corrado Donato Da Fano, M.D.(Pavia), and James Pryde, B.Sc.(Edin.), were proposed as Fellows.

Mr. A. Bruce Jackson, A.L.S., read a paper "On a New Hybrid Conifer, *Cupressus macrocarpa* × *nootkatensis*," of which the following is an abstract:—

A branch of a Cypress from Leighton Hall, near Welshpool, was received at Kew, and excited special interest from the fact that it combined the characters of the above-named species. The owner, Capt. Naylor, says the tree was raised in 1911 from seeds of a cone taken from a tree of *Cupressus macrocarpa*, growing about 50 yards from one of *C. nootkatensis*, which was evidently the pollinating plant.

Capt. Naylor says, however, that a much earlier mating between the species occurred at Leighton in 1888, when his uncle, Mr. Leyland, raised the same hybrid from a tree of *C. nootkatensis*, the male parent being in this case the same tree of *C. macrocarpa*, which took part in the reciprocal cross 23 years later. So far there appears to be no previous record of a hybrid in this genus.

In reply to the President, Mr. Jackson stated that the hybrid was more vigorous than either of the parents, but he was unable to say whether it was more fertile.

Mr. W. B. Turrill commented upon the geographical isolation of the parent species, and suggested that the fact of isolation should be carefully considered in all attempts at specific delimitation. Geographical isolation was not, however, the only form of isolation, another being isolation by refusal to cross, as in some species of *Nemophila*.

On the President remarking that the two species under discussion did not display any great alacrity in hybridizing, Mr. Jackson stated that they had been associated in cultivation for many years.

Mr. B. O. Coventry (Visitor) exhibited a series of Lumière coloured lantern-slides of Kashmir scenery and plants.

The President, in expressing the thanks of the Society to Mr. Coventry for the exhibition, congratulated him on the beauty of the photographs. The incidental mention by Mr. Coventry of the change of colour in the corolla of certain species elicited remarks from Messrs. R. E. Chapman, A. J. Wilmott, E. J. Collins, S. K. Mukerji, J. Ramsbottom, W. C. Barton, and Mrs. Rose Thomas as to the occurrence of colour changes in flowers in various parts of the world.

Dr. O. Stapf expressed the opinion that in view of the wonderful attractions of Kashmir and the probable future development of

that country, it was of great importance that a 'Flora' of the State should be worked up and published. He also referred to the desirability of cultivating more Kashmir plants in the gardens of the British Isles, and laid stress upon the great importance of the exploration of the Kashmir Flora, and of its plant-associations from a phytogeographical point of view.

Dr. C. C. Hurst read a paper "On the Nature and Origin of Species in *Rosa*."

The genus *Rosa* may be divided into two major groups: (1) Diploid, with 7 gametic chromosomes: (2) Polyploid, with multiples of 7. Diploids fall naturally into 5 discontinuous species which breed true to their structural characters, are intrafertile and intersterile. Polyploids (except a few duplicated cultivated forms) are composed of various combinations of characters and chromosomes of the 5 diploid species. The 5 diploid species are distinguished as AA, BB, CC, DD, and EE, where each letter represents a set of 7 chromosomes, or septet, carrying the linked genes peculiar to the species. Consequently each polyploid species has a formula for identification and classification, e. g. *R. pendulina* L. = DDEE (tetraploid), *R. canina* L. (s. s.) = AABDE (pentaploid), *R. Moyesii* Hemsl. & Wils. = AABBEE (hexaploid), *R. acicularis* Lindl. = BBCCDDEE (octoploid). Thus one species differs from another by one or more septets of chromosomes and characters, and septet species are precise taxonomic species subject to experimental verification by cytological and genetical methods. These septet combinations make 31 regular species possible in *Rosa*, 23 of which have been identified. Chromosomes of diploid and polyploid species may be frequently observed working in septets during mitosis and meiosis. The peculiar behaviour of septet genes in polyploid species presents a new mode of heredity with non-Mendelian ratios, and offers a solution of the problem of the inheritance of acquired characters. Three diploid species which do not conform to the septet formulæ are classed as distinct genera. These monotypic genera may be relics of the Tertiary flora, since one of them from California resembles a Miocene specimen of the Protorosæ recently found in Colorado.

In view of the presence of the characters and chromosomes of two or more diploid species in the polyploid species, it is tempting to assume that the polyploid species have arisen by hybridization of the 5 diploid species. Evidence of defective pollen, unbalanced chromosomes, and the septet formulæ of phenhybrids and crypthybrids in European polyploid species was presented, which supports the assumption of the origin of species by hybridization. There are, however, serious difficulties in accepting the theory of hybridization as a complete explanation of the origin of the genus as a whole. The chief difficulty lies in the facts of geographical and ecological distribution, which seem to demand an alternative explanation: *e. g.* (1) All the species are

confined to the Northern Hemisphere; (2) octoploid species are circumpolar; (3) diploid species extend to the Tropics and have peculiar habitats; (4) tetraploid and hexaploid species have a middle position. This distribution coincides with accepted views of the arctic origin of the land flora of the Northern Hemisphere, and points to an origin by descent from an arctic decaploid species with 5 double septets of chromosomes and characters, generalized and adapted to variable conditions, which, by successive losses of whole septets, gave rise to the lower polyploid species and eventually to the 5 specialized diploid species. Direct evidence of the loss of septets in polypoid species under changed conditions of centuries of cultivation in distant countries was presented. Loss of septets by disuse under extreme changes would be natural, as each septet represents an ecological value expressed in the ecological isolation of the 5 diploid species. In this sense, conditions of life would directly determine the trend of speciation, thus providing the material for the Natural Selection of individuals.

The original decaploid species would most probably arise by duplications of an ancient diploid species under luxuriant conditions, just as duplicated forms have arisen under cultivation. This would be followed, in secular time, by differentiation of the 5 double septets of chromosomes and characters by duplicational segregations and gene mutations, thus giving rise within itself to the potentiality to throw off numerous new septet species by losses of septets. In this way evolution would be an alternating process, from diploid to polyploid species (*i. e.* creative) and from polyploid to diploid species (*i. e.* emergent), according to geological conditions. This mechanism of alternating creative and emergent evolution in association with other secondary processes such as hybridization and chromosome mutations of the *Œnothera lata* type would also serve to explain the origin of the Tribes and Families of the Order *Rosales*, including the numerous extinct species eliminated by Natural Selection.

As the hour was late no detailed criticism of the paper was possible, but the President, Prof. R. R. Gates, Dr. W. T. Calman, Mr. A. J. Wilmott, Mr. C. V. B. Marquand, and Mr. W. C. F. Newton contributed remarks, and Dr. Hurst briefly replied.

18th February, 1926.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 4th February, 1926, having been circulated, were confirmed.

The President referred to the recent death of the late Dr. William Bateson, F.R.S., and stated that he had been present at the Memorial Service held on Friday, the 12th February, in

St. John's College Chapel, Cambridge; he then moved the following Resolution, adopted in silence unanimously, those present standing in their places :—

> That the Fellows of the Linnean Society in General Meeting assembled desire to express their deep sense of the grievous loss which Science has sustained by the death of Dr. William Bateson.
>
> And the Fellows would also record their high appreciation of Dr. Bateson's services to the Society as a Vice-President, a Member of Council, and an eminent and helpful Fellow.

It was announced from the Chair that the next Hooker Lecture would be delivered by Prof. Carl Schroeter, F.M.L.S., of Zürich, on the 15th April next, entitled "The Swiss National Park, and scientific researches into its nature."

Further, it was stated that a meeting of Botanists would take place in the Society's Rooms on Wednesday, 10th March next at 3.30 P.M., to consider a suggestion that the Fifth International Botanical Congress should take place in London in 1930.

Mr. Herbert Edward Forrest, Mrs. Ruth Culshaw Bisbee, and Mr. Sushil Kumar Mukerji, M.Sc., were admitted Fellows.

Certificates in favour of Dr. Frederick Merlin Haines, B.Sc., Ph.D.(Lond.); Miss Mary Florence Rich, M.A.(Dubl.); Dr. Nellie Carter, D.Sc.(Birm.); Norman Boyd Kinnear; Miss Helen Mary England, M.Sc.; Richard Waterfield, B.A.(Oxon.); Philip James Barraud, F.Z.S., F.E.S.; Miss Eva Jennie Fry, M.Sc.(Wales); Dr. Corrado Donato Da Fano, M.D.(Pavia); and James Pryde, B.Sc.(Edin.), were read for the second time.

Iolo Aneurin Williams; William James Rolph Deeks, B.A.(Cantab.); and Harold Wilkinson, A.R.C.Sc., were proposed as Fellows.

Owing to the illness of the author, the paper by Mr. C. C. A. Monro on the "Polychæta of the 'Alert' Expedition: Families Hesionidæ and Nereidæ" was taken as read.

This paper is the last of the series containing a systematic account of the Polychæta collected by H.M.S. 'Alert' during her voyage in 1881–2. It is an account of the families Hesionidæ and Nereidæ and attempts to place the classification of the genus *Hesione* on a more satisfactory basis. All the examples with which it deals are from the Indo-Pacific area, and a number of new species are described.

Mr. J. Ramsbottom exhibited a series of aerial photographs and lantern-slides lent by Mr. O. G. S. Crawford, of the Ordnance Survey. These, taken for archæological purposes, illustrated the

prevalence of "Fairy Rings" on downs; the appearance and manner of growth of the rings were described. In response to the President, Mr. Crawford expressed the opinion that the determination of the age of "Fairy Rings" might well prove of value in archæological work. He agreed that interesting points in succession might be made out, and stated that the appearance of the vegetation, as viewed or photographed from an aeroplane, differed according to the time during which the areas under inspection had been under or free from cultivation.

Mr. S. Garside asked some questions about photographic technique.

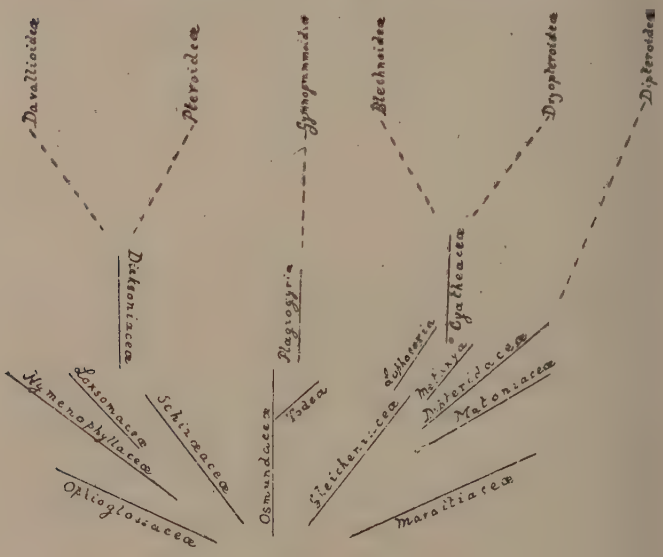
Dr. Hamshaw Thomas stated that with suitable photographic plates and filters, and under favourable illumination, differences in the character of the vegetation, imperceptible to ordinary naked-eye examination, appeared with remarkable clearness in the photographs.

Colonel Tull Walsh referred to the similarity of the spreading of "Fairy Rings" and of the fungus causing Ringworm.

Professor F. O. Bower, F.R.S., expounded, and illustrated with a series of lantern-slides, "A scheme of Phyletic grouping of Ferns."

In 'The Ferns,' vol. i., an analysis has been given of those criteria of comparison of the Class which may be used with a view to their phyletic grouping. These have been arranged under twelve heads, but subsequent writers may add to their number. In respect of each of them the attempt has been made to distinguish features that are relatively primitive from those which there is reason to believe are more advanced; and so far as possible the conclusions have been checked according to the positive data of Palæontology. This analysis led up to a verbal précis embodying the most archaic characters. An "archetype" for the Class may thus be visualized, which is substantially similar to plants which were actually living in the Devonian Period: viz., the Psilophytales. Without suggesting that these include the direct ancestry of the Filicales, there is a general similarity which the verbal sketch bears to these ancient examples of a land-vegetation. Such an archetype would consist of a simple upright shoot of radial symmetry, possibly rootless, dichotomizing if it branched at all, and with the distinction between axis and leaf ill-defined. The leaf, where recognizable as such, long-stalked with distal dichotomy, tending in advanced forms towards the sympodial origin of a dichopodium. All the limbs of the dichotomy would be narrow, and distinct from one another. The whole plant would be relatively robust as regards cellular construction, and traversed by conducting strands with a solid xylem-core. The surface might be glabrous, or invested with simple hairs. The solitary sporangia would be relatively large and distal in position, with thick walls and a simple method of dehiscence, and each would contain numerous homosporous spores.

The second volume, now passing through the press, is devoted to those Ferns which both comparison and Palæontology indicate as relatively primitive. They include all the Eusporangiate Ferns, together with certain families which evidence of a like nature shows as sharing archaic features, while almost all of their types date from Palæozoic, or at least from Mesozoic, times. The old question of the relative priority of the Eusporangiate as distinct from the Leptosporangiate type may be held as finally decided by the geological evidence. But between these types, as distinguished by von Goebel in 1881, it must be clearly understood that no sharp demarcation exists: intermediate types are found in such living families as the Osmundaceæ, Schizæaceæ,



and Gleicheniaceæ. All of these are Simplices, and all date back to Mesozoic or even to Palæozoic time. Their existence makes it appear probable that in the course of descent a gradual transition took place from the Eusporangiate to the Leptosporangiate state. The results have been formulated in a phyletic scheme which presents roughly to the eye the relations of the more primitive families of Ferns.

No attempt is made in the accompanying scheme to construct an evolutionary tree with connected limbs, but only to indicate such general relations as follow from wide comparison. The arrangement is based upon certain conventions. Those Ferns that are

held as the most primitive are placed lowest, and it will be found that they include the earliest fossil types. To the left are those in which the sori are distal or marginal in position, a feature which they share with the Botryopterids. To the right are those in which the sori are superficial, a state that is regarded as a secondary result of a widened leaf-area. The reason for attaching weight to this distinction is that, once attained, the superficial position of the sorus—with its obvious biological advantage—is generally permanent. The marginal is probably the primitive position; some families departed from it early (Marattiaceæ, Gleicheniaceæ); others tenaciously retained the marginal position (Ophioglossaceæ, Hymenophyllaceæ, Loxsomaceæ); others again show various degrees of adoption of the superficial position (Schizæaceæ, Dennstædtiinæ). The Osmundaceæ are particularly interesting in this feature: for in *Osmunda* the sporangial tassels are marginal, in *Todea* superficial; but abnormal *Osmunda* sporophylls with broadened surface bear their sporangia superficially, as in *Todea*.

The application of this distinction separates the Dicksoniaceæ from the Cyatheaceæ, though most systematists place them together. But their separation is supported by the intermediate links that exist between these gradate Ferns and the Simplices. For instance, *Lophosoria* and *Metaxya*, which are superficial Simplices, lead to the gradate and still superficial *Alsophila*. There are also anatomical distinctions; moreover, while the Dicksoniaceæ have only hairs the Cyatheaceæ have broad scales as their dermal appendages. Thus the separation of the Dicksoniaceæ and Cyatheaceæ, originally associated chiefly on the ground of their dendroid habit, has other justification than the mere soral position, which in itself might well suffice.

The scheme accords with the distinction of the primitively simple sorus from the gradate and the mixed. All the lowest groups in the scheme (excepting Hymenophyllaceæ and Loxsomaceæ) are Simplices. The gradate state was adopted in some lines but not in all, and it was not an obligatory step. For instance, in *Plagiogyria* and *Dipteris* there is evidence of a direct step from the simple to the mixed sorus. But as a rule the mixed condition was not attained till we arrived at those six large groups named at the top of the scheme, into which fall the mass of modern Leptosporangiate Ferns. These are named after certain leading genera, and are believed to have originated as the dotted lines suggest. It will be the subject of the third volume to trace out, as far as possible, the phyletic relations within those groups. But here the difficulties which arise from widespread polyphylesis complicate the problem. In particular, the Acrostichoid state has probably arisen along fully six distinct phyletic lines, while the Polypodioid state has probably originated, on the one hand, from primitively naked superficial sori, such as those of *Gleichenia* or *Dipteris*; on the other, by the abortion of the indusium either of a Pterid (*Hypolepis*) or of a Dryopterid (*Dryopteris*

Phegopteris). The logical result of such views will then be that the old generic names of *Polypodium* and *Acrostichum* do not connote genera of blood-relationship at all. Their soral condition represents not real affinity but a biological state that may be arrived at polyphyletically. They are mentioned here to show examples of the subversive effect of phyletic study upon the older systematic groupings.

In the ensuing discussion Dr. D. H. Scott said he would only refer to one or two points among the fossils. When he saw the Marattiaceæ appearing so early in the scheme, he felt that there was a skeleton at the feast! Did Palæozoic Marattiaceæ exist? The late Dr. Kidston, in his sixth Memoir (p. 538), after discussing certain Coal-Measure genera, said: "It would therefore appear that the evidence in support of the occurrence of Marattiaceous Ferns in Carboniferous times rests on supposition rather than on satisfactory proof." As regards the other group at the same level in the scheme, the Ophioglossaceæ, its position was admittedly hypothetical. Dr. Kidston had pointed out that in the Lower Carboniferous we knew of no other Ferns than the Botryopteridaceæ. The speaker thought that one of their tribes, the Zygopterideæ, was too specialized to have been likely to give rise to anything else. The simpler Botryopteridæ, however, might well have proved more plastic. He would like to ask Prof. Bower whether there was any evidence for marginal insertion of the sporangia among the Botryopteridaceæ? In the fructifications known to the speaker, the insertion was simply distal; there was no question of marginal or superficial position.

Dr. Hamshaw Thomas was prepared to admit that the Zygopterideæ had some relation to the Ophioglossaceæ.

Prof. C. E. Moss mentioned the case of a South African Fern which was referred to either as *Asplenium theciferum* or *Davallia thecifera*.

Mr. A. J. Wilmott considered that in the making of phylogenetic trees the distinction between character and stock (lineage) was not sufficiently considered. He regarded a stock as composed of characters much as a house is built of bricks etc.; and a character such as Prof. Bower termed "acrostichoid" may well have arisen at an early date, and by persistence in many lineages give rise to the appearance of being polyphyletic. This mode of so-called polyphyletic occurrence seemed to occur in all classes of organisms. It was general to find a given character constant in one group, and inconstant in various degrees in others. Every character was good for diagnosis in some groups and bad in others; there was no completely "good" character. To him this indicated the independence of character in relation to stock. Such "polyphyletic" occurrence of the acrostichoid character would not worry him, as he regarded it as a general feature common throughout organic life, and one very insufficiently recognized.

Mr. E. J. Collins asked how the sorus was derived in *Ophioglossum* itself.

Prof. Bower, in his reply to criticisms, accepted the Zygopteroids as highly specialized, and that there were no Palæozoic Marattiaceæ. He claimed that this simplified his case. In reply to Dr. Thomas, he stated that the annulus of the Osmundaceæ was under investigation, and referred to the genus *Boweria*, with an Osmundaceous annulus, as leading on to the *Plagiogyria* type. As regards *Ophioglossum*, that particular genus was not a primitive but a derivative type, and not really representative of the Ophioglossaceæ.

4th March, 1926.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 18th February, 1926, having been circulated, were confirmed.

Prof. Wilfred Eade Agar, D.Sc., F.R.S., was admitted a Fellow.

Certificates in favour of Iolo Aneurin Williams; William James Rolph Deeks, B.A.(Cantab.); and Harold Wilkinson, A.R.C.Sc., were read for the second time.

Fred Howarth, B.Sc.(Lond.), A.R.C.Sc., was proposed as a Fellow, and Dr. Wilhem Ludvig Johannsen and Prof. René Maire were proposed as Foreign Members.

Dr. Suresh Chandra Ray, F.Z.S.; David Joseph Scourfield, I.S.O., F.Z.S., F.R.M.S.; Dr. Frederick Merlin Haines, B.Sc., Ph.D.(Lond.); Miss Mary Florence Rich, M.A.(Dubl.); Dr. Nellie Carter, D.Sc.(Birm.); Norman Boyd Kinnear; Miss Helen Mary England, M.Sc.; Richard Waterfield, B.A.(Oxon.); Philip James Barraud, F.Z.S., F.E.S.; Miss Eva Jennie Fry, M.Sc. (Wales); Dr. Corrado Donato Da Fano, M.D.(Pavia); and James Pryde, B.Sc.(Edin.), were elected Fellows.

The President referred to a specimen of *Typha latifolia* received from Mr. J. H. Owen, of Felsted, which was shown at the Meeting held on 17th December, 1925, and reported that the culm appears to have been split below during the development of the inflorescence. The exposed edges of the split, including part of the inflorescence, have healed, but are not re-united, so that the condition has the appearance of two fused inflorescences.

Mr. E. Heron-Allen, F.R.S., gave an account of the history of the myth of the Barnacle-Goose, entitled "The Iconography of a Myth," illustrated with lantern-slide reproductions of its representations from Mykenæan times to the 17th century. The legend that the stalked Barnacle, *Lepas anatifera*, occurred upon trees overhanging the water, or upon rotten timber, and, at

maturity, produces a goose or duck, permeates scientific literature from the XIth to the XVIIth centuries, and since the invention of printing has been fancifully illustrated. The myth appears to have passed current in the Near East in 1000 B.C., and is illustrated upon Mykenæan pots.

The President and Mr. J. T. Cunningham commented on the interesting way in which the development of the myth had been traced by Mr. Heron-Allen.

Mr. C. J. Stubblefield read his paper "Notes on the development of the Trilobite, *Shumardia pusilla* (Sars) (communicated by Dr. H. G. Cannon), illustrating his remarks by a series of lantern-slides.

This paper treated of the developmental history of the small, apparently blind, Tremadocian trilobite, *Shumardia pusilla*, found as a zone-fossil in the Shineton Shales of Shropshire. A large number of complete specimens have been collected ranging in length from 0·24 mm. in the earliest or "Protaspid Period" to 4·91 mm. in the latest or "Holaspid Period."

These and the immediate growth-stages were described, and it was shown that the six thoracic segments are released one by one from dorsal fusion in the posterior shield or "transitory pygidium." It is considered that *S. pusilla* offers new evidence in favour of the hypothesis, advanced by Beecher in 1896, that the growing point of the new segments in trilobites was in front of the most posterior or anal segment. The 4th post-cephalic segment of *S. pusilla* is easily distinguishable from the other post-cephalic segments by the possession of long pleural spines; these are first definitely recognized when the segment bearing them is immediately in front of the most posterior segment, and subsequently the forward movement of this spined segment is seen as segments are introduced behind it.

From these observations a solution was offered of the problem recently revived by Raymond concerning the true orientation of the trilobite *Agnostus*.

Dr. H. G. Cannon and Prof. E. W. MacBride referred in complimentary terms to the accuracy and importance of Mr. Stubblefield's work. Mr. J. T. Cunningham suggested the possibility of the trilobites being the marine ancestors of the Tracheata. Dr. W. T. Calman deprecated strongly the idea of treating the Tracheata as a homogeneous group.

Dr. H. G. Cannon explained, with lantern-slides, his paper "On the post-embryonic development of the Fairy Shrimp (*Chirocephalus diaphanus*)."

The development of *Chirocephalus diaphanus* is essentially similar to that of *Estheria*. Cœlomic sacs are formed as in the latter, but do not attain any considerable size owing to the precocious development of the pericardial cavity. The method of

heart-formation differs in different parts of the body. In the anterior segments the lower parts of the cœlomic sacs grow inwards first of all to form the floor of the heart, while in the posterior segments it is the roof that is first formed. In between, in the region of the genital segment, the cavity of the heart becomes temporarily occluded owing to the upper and lower parts of the cœlomic sacs growing inwards together. The development of the maxillary gland shows no essential differences from that of *Estheria*. The antennal gland shows very clearly, between end sac and duct, a sphincter consisting of three cells connected directly to the cuticle. The musculature is more complex than that of *Estheria*, there being a series of "connective muscles" between the dorsal and ventral longitudinal muscles. The dorso-ventral muscles, the proctodæal dilators, and probably the stomodæal dilators are of ectodermal origin.

Prof. MacBride referred to Dr. Cannon's work as a foundation for building up our knowledge of the origin of the organs of the Arthropoda.

Mr. H. W. Pugsley, in connexion with his paper "Further Notes on *Fumaria* and *Rupicapnos*," gave a brief general sketch of the salient features of the vegetation of Algeria, and illustrated with lantern-slides both his general remarks and his particular notes on the two genera. Since the publication of the revision of these genera in the Society's Journal in 1919, a number of specimens have been received for examination from Algerian botanists, especially from Dr. R. Maire, of the University of Algiers. This material is largely the fruit of recent French botanical expeditions into parts of Morocco hitherto unexplored, and has yielded some new species both of *Fumaria* and *Rupicapnos*. New forms were also discovered in Algeria during a visit to that country in 1922.

The President and Mr. E. G. Baker contributed further remarks.

18th March, 1926.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 4th March, 1926, having been circulated, were confirmed.

Mr. Richard Waterfield, B.A.(Oxon.); David Joseph Scourfield, I.S.O., F.Z.S., F.R.M.S.; and Dr. Corrado Donato Da Fano, M.D.(Pavia), were admitted Fellows.

Certificates in favour of the following were read for the second time:— Fred Howarth, B.Sc.(Lond.) as Fellow; and Dr. René Maire and Dr. Wilhem Ludvig Johannsen as Foreign Members.

The following were proposed as Fellows:—Mrs. Eleanor Mary Hughes Gibb; Reuben Tomlinson Millott, F.Z.S., F.E.S.; and Miss Helene Elizabeth Bargmann, B.Sc., F.Z.S.

Iolo Aneurin Williams; William James Rolph Deeks, B.A. (Cantab.); and Harold Wilkinson, A.R.C.Sc., were elected Fellows.

The PRESIDENT, referring to a circular letter sent to every Fellow at the end of last Session, mentioned that the portrait of the General Secretary, by Mr. Ernest Moore, was nearly finished. Fellows who wished to participate in the gift and had not already communicated with Mr. Ramsbottom were invited to do so at once.

Mr. J. L. SAGER exhibited fresh specimens of *Primula* flowers which showed the petals like foliage leaves in all respects except size, and were extreme examples of phyllody of the corolla. The revolute venation characteristic of the leaf showed well in these petals. Calyx, stamens, and pistil appeared normal. Mr. Samuel E. Steer found this Primrose plant growing in a disused burial-ground at Lympstone, South Devon, in March 1925. He dug the plant up and transferred it to his garden at Exeter, where it has increased in size, and is now bearing about twelve flowers, all abnormal.

The President remarked on the unusually fine development of the condition in Mr. Sager's specimens, and stated that Mr. F. J. Chittenden had also sent a specimen of a virescent Primrose from Maidstone, in which, however, the petals were not nearly so distinctly foliaceous as in Mr. Sager's plant; the Maidstone specimen represented the well-known green Primrose, figured by Parkinson and Gerard. In reply to a question by Sir Sidney Harmer, Mr. Sager stated that he would endeavour to regulate pollination by protecting the plant.

The President showed a dried specimen (from Brockenhurst) illustrating phyllody of the calyx, in which the sepals were much enlarged, broad and leaf-like in appearance. He also showed a fine specimen of a caulescent Primrose sent by Mr. Walter Barratt, F.L.S., from Mullion, Cornwall. The very short stem on which the flowers are borne in a normal Primrose had become much elongated, and bore a truss of true Primrose flowers. The inflorescence suggested a huge Oxlip.

Dr. R. T. GUNTHER gave an account—illustrated with lantern-slides and a facsimile reproduction by Captain E. G. Spencer-Churchill for presentation to the Roxburghe Club—of the early manuscript herbal of Apuleius Barbarus, which has been stated to have been written in 1100 A.D. and illustrated in the monastery of Bury St. Edmunds; it may therefore be the oldest-known English botanical work.

The President commented on the difficulties of identifying the plants in many cases, owing to the confusion between text and illustrations.

In the absence of the author an account was given by Dr. W. T. Calman of Mr. G. P. Farran's paper "Biscayan Plankton collected during a Cruise of H.M.S. 'Research,' 1900.—Part XIV. The Copepoda." (Communicated by Dr. G. Herbert Fowler, F.L.S.) The following is the author's abstract.

The Copepoda collected in deep water off the Bay of Biscay during the cruise of the 'Research' were mainly taken in numerous horizontal hauls with open tow-nets by day and night down to 100 fathoms, and by vertical hauls with closing nets by day down to 2000 fathoms.

The horizontal hauls show a marked difference between day and night distribution, the population above 100 fathoms being approximately doubled by night by the upward migration, in large numbers, of *Metridia lucens*, *Pleuromamma robusta*, and *Pleuromamma gracilis*, accompanied by smaller quantities of several other species.

In the vertical hauls the maximum number of species, namely 66, an average of 39 per haul, was found between 500 and 700 fathoms, and of specimens between 150 and 250 fathoms. The average number of specimens per 100 fathoms vertical haul between 1500 and 2000 fathoms was only 4·6, and not all of them alive, as against 781 specimens between 150 and 250 fathoms.

The total number of species found was 150, of which fourteen are described as new.

Mr. Scourfield, in connection with the restricted vertical range of certain species of Copepoda, mentioned that a similar restriction of vertical range, although, of course, on a much smaller scale, was evident in the case of freshwater organisms. Dr. R. T. Gunther asked whether deep-water Copepoda were noticeably larger than surface species. Dr. Calman replied that certain deep-water species were relatively of enormous size.

Dr. Helena Bandulska read her paper "On the Cuticles of some Fossil and Recent Lauraceæ," illustrated with lantern-slides.

The paper demonstrated the possibility of interpreting certain elements of the floras of the past by a comparative study of their cuticles with those of recent forms. By this means the Lauraceæ have been found to be the most abundant fossils with cuticle preserved in the Bournemouth Eocene; many have lanceolate leaves with pinnate venation and strong midrib. Three species of *Aniba* and various species of *Neolitsea*, *Litsea*, and *Lindera* have been discovered.

The leaf previously described as *Dicotylophyllum spiculatum* is now referred to the genus *Aniba*, and is named *Aniba spiculata*. *Aniba* has a tough resistant epidermis. The lower surface possesses

depressed, scale-bearing guard-cells, surrounded by two or four accessory cells, which in some species are markedly lobed and have a cruciform outline and strongly thickened free border. Spicular ridges may be present.

Neolitsea and *Litsea* are closely-related genera with far less resistant cuticle than *Aniba*. They, too, have complex stomata—scale-bearing guard-cells bordered by unequal accessory cells, one of which may be more or less triangular, while the wall common to accessory cell and guard-cell tends to break down, giving an appearance of extreme breadth to the stoma.

A fossil *Neolitsea*, *N. Gardneri*, has been identified *in situ* in the Bournemouth cliffs, and two magnificent specimens of the same species were found in the collection of Mr. Starkie Gardner.

Three different species of *Litsea* have been distinguished, which, while quite evidently belonging to the genus, cannot be referred to living species:—*Litsea Edwardsi*, which has a very delicate cuticle with asymmetrical stomata and a sinuate-walled upper epidermis; *L. hirsuta*, with straight-walled epidermis and vary numerous hairs and delicate cuticle; and *L. bournensis*, with tougher cuticles, more numerous stomata, thick straight-walled epidermal and venule cells.

Three fossil Linderas have been collected *in situ*:—*Lindera cinnamomifolia*, *L. cinnamomifolia* var. *porifera*, and *L. Batheri*.

The genus *Lindera* has thin-walled transparent stomata with guard-cells of variable size, often depressed and overlapped or bordered by a varying number of accessory cells. The poles of the long axes of the guard-cells and scales are prolonged and nodulose. The poral outline is much like that of *Pseudonavicella*.

The leaves show paired secondary veins springing from the base of the midrib, so that the lower part of the leaf appears tri-nerved. This is typical of many recent Linderas.

Lindera cinnamomifolia and *L. cinnamomifolia* var. *porifera* differ from each other mainly in the number of openings on the lower epidermis, which suggest water-pores, and in the greater xerophily of the latter. Their epidermis is straight-walled. *Lindera Batheri* has the most delicate cuticle of the three, and resembles in many ways the recent species *L. præcox*. It has sinuate-walled epidermal cells.

It is evident that the physiological characters of the fossil Lauraceous cuticles here described are such as at the present time are associated with the need for controlling transpiration, and may be of assistance in the interpretation of the nature of the flora and the climate of Middle Eocene time.

Mr. W. N. Edwards remarked that the genera found fossil by Dr. Bandulska were now East Asiatic in distribution, which supported the view, put forward by Mr. and Mrs. Reid, that the Tertiary flora of Europe resembled that of certain East Asiatic regions of the present day. It would be interesting to hear details of the geographical distribution of those living species which showed the greatest affinity to the Bournemouth fossil species.

Dr. D. H. Scott remarked on the value of Dr. Bandulska's careful investigations. Mr. H. N. Ridley referred to the difficulty in separating *Litsea* and *Neolitsea*. Species of *Litsea* with broad leaves were mainly confined to the wet forests, while species with narrow leaves occurred usually on dry hills at considerable elevations. Most of the species of *Lindera* and *Neolitsea* were more or less xerophytic and hill dwellers.

Mr. A. J. Wilmott expressed the view that the apparent stability of foliage characters over long periods of time was in opposition to the usual idea of their rapid change by adaptation, and gave some ground for doubting whether ideas of convergence were always valid.

15th April, 1926.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 18th March, 1926, having been circulated, were confirmed.

Mr. Fred Howarth, B.Sc., A.R.C.S., was elected a Fellow.

Certificates in favour of the following were read for the second time: Mrs. Eleanor Mary Hughes Gibb; Reuben Tomlinson Millott, F.Z.S., F.E.S.; Miss Helene Elizabeth Bargmann, B.Sc., F.Z.S.; and Dr. René Maire and Dr. Wilhem Ludvig Johannsen as Foreign Members for the third time.

The following were proposed as Fellows:—Macgregor Skene, D.Sc.; Ernest Victor Laing, M.A., B.Sc.; and Charles Tate Regan, M.A., F.R.S.

The election of Auditors was proposed from the Chair, and carried by show of hands as follows: For the Council, Mr. E. A. Bunyard and Mr. R. I. Pocock; for the Fellows, Mr. R. Paulson and Mr. H. N. Ridley.

The President then called upon Professor Carl Schroeter, F.M.L.S., of Zürich, to deliver the Hooker Lecture on "The Swiss National Park, and Scientific Researches into its Nature."

After thanking the Society for his election as a Foreign Member, Prof. Schroeter referred to the career of Sir Joseph Hooker, not only as a great systematist, but as one of the founders of modern plant-geography by his studies on the New Zealand, Tasmanian, Arctic, and Antarctic Regions.

The foundation of the Swiss National Park was due to the movement for the protection of Nature, which is becoming general throughout Switzerland. There are societies for the protection of birds, forests, and beauty spots. The League for

the Protection of Nature has nearly 30,000 members paying an annual sum of two francs, or fifty francs for a life-member. The result up to now has been the protection of a number of mountains from invasion by railways, the preservation of 400 erratic blocks, fifty trees of special beauty, fifteen fens, twenty bird-sanctuaries, and districts where shooting is prohibited. After defining the limits of the park, the lecturer indicated the following rules that are in force:—Shooting, fishing, manuring, grazing, mowing, and wood-cutting are entirely forbidden. No flower or twig may be gathered, no animal killed, no stone removed, and even fallen trees must remain untouched; thus, Nature alone is dominant. Huts are provided but no hotels, camping and fires are prohibited, and there are four resident keepers under a commission of five members appointed by the Government, which pays the rent of the park, the Swiss League for the Protection of Nature maintaining the paths and huts.

The elevation of the park is high, the snow-line is at 3000 metres, the tree limit at 2300 metres; the area is not populated; it has extensive forests, mainly of *Pinus montana* var. *arborea* and *P. Cembra*, with an abundant herbaceous flora corresponding to the great variety of geological strata. Animal life abounds: deer, chamois, marmots, foxes, heath-cocks, and golden eagle are abundant.

The favourable effects are clearly visible after ten years' reservation, and the number of animals has much increased. Deer in seven years increased from 12 to 90, chamois from 1000 to 1250, ptarmigan from 120 to 310, and golden eagles from 15 to 40. The preservation of certain beasts of prey is requisite as a hygienic measure, as they kill sick animals first; in one place foxes had been exterminated, and an epidemic amongst hares set in, so that foxes had to be re-introduced.

The lecturer then enumerated the scientific researches carried on under perfectly natural conditions, with the reports already published by forty investigators. Seventy-two lantern-slides were shown, most of them coloured, and the lecturer concluded with the hope that he might have the pleasure of conducting a party from our Society through this attractive portion of the Engadine.

At the conclusion of the lecture the President expressed to Prof. Schroeter the thanks of the Society, and further remarks were made by the following:—Mr. A. G. Tansley, F.R.S. (visitor), Dr. R. Lloyd Praeger (visitor), Dr. E. J. Salisbury, Dr. G. Claridge Druce, Dr. O. Stapf, F.R.S., Dr. T. W. Woodhead, Lt.-Col. J. H. Tull Walsh, Mr. C. Leonard Huskins (visitor), Mr. C. C. Lacaita, and Dr. W. T. Calman, F.R.S., Sec.L.S.

6th May, 1926.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of 15th April, 1926, having been circulated, were confirmed.

Mr. James Pryde, Miss Mary Florence Rich, Dr. Nellie Carter, Dr. Frederick Merlin Haines, and Mr. Bernard Cuthbert Ellison, were admitted Fellows.

Certificates in favour of Macgregor Skene, D.Sc.; Ernest Victor Laing, M.A., B.Sc.; and Charles Tate Regan, M.A., F.R.S., were read for the second time.

Prof. John William Bews, Prof. William John Dakin, D.Sc., and Arthur George Tansley, M.A., F.R.S., were proposed as Fellows.

Mrs. Eleanor Mary Hughes Gibb; Reuben Tomlinson Millott, F.Z.S., F.E.S.; and Miss Helene Elizabeth Bargmann, B.Sc., F.Z.S., were elected Fellows; and Dr. René Maire and Dr. Wilhem Ludvig Johannsen as Foreign Members.

The PRESIDENT announced that it was proposed to hold an Official Dinner after the Anniversary Meeting on the 27th instant. He also stated that Dr. B. DAYDON JACKSON was retiring on that date from the office of General Secretary, and had been appointed to the special post of Curator of the Linnean Collections. He then alluded to the Resolution passed at the General Meeting of the 7th January last, concerning the preservation of the original fauna and flora on Kangaroo Island, South Australia, and stated that he had received a letter and enclosure from our Fellow, Dr. R. S. Rogers, thanking the Society for its Resolution, which has been widely published.

The exhibition of a supposed new "mutation" in the Rabbit, by Captain J. G. Dollman, was postponed.

Dr. A. W. HILL, F.R.S., read his paper on "The Genus *Lilæopsis*, a Study in Geographical Distribution." The paper was illustrated by a series of excellent photo-micrographs of cross-sections of the fruits of the different species, for which the sections had been cut by Mr. L. A. Boodle and the photographs taken by Dr. Rodman. The author's abstract is as follows.

Under the name *Crantzia lineata*, Nuttall described a small Umbelliferous plant from swamps in New Jersey. The earliest specimen of a *Crantzia*, however, proves to be Linné's *Hydrocotyle chinensis* which is identical with Nuttall's *C. lineata*.

In the year 1891 Greene named this genus *Lilæopsis*, which name is now retained.

A re-examination of all the available material shows that there are some fourteen clearly-marked species. Three of these occur in N. America from Alaska to Florida and Arizona, one both in eastern N. America and in eastern S. America, and one in Mexico and in Ecuador. One is found in Brazil and one in the Andes of S. America, another in western S. America and Chile, and one in the Falkland Islands and in S. Georgia, while the remaining species are natives of Tasmania, Australia, and New Zealand.

The species can be determined from the character of the fruits. It has been found that the leaves are rather in the nature of phyllodes, since a specimen has been found with small leaflets attached to the septate rachis.

The President congratulated Dr. Hill on the interesting character of his paper, and asked whether there was any explanation for the inappropiate trivial name given by Linnæus to the species named by him *Hydrocotyle chinensis*.

Dr. B. D. Jackson remarked that many of the localities specified by Linnæus were incorrect, probably due to defect of memory or possibly mixing up specimens, as he was very lax in localising the sheets in his herbarium.

Dr. Hill, in reply to a question by Professor R. R. Gates regarding the structure of the septate markings of the phyllodes, stated that there had not been opportunity to investigate it.

Mr. R. D'O. Good gave an account of his paper on "The Genus *Empetrum*," illustrated by lantern-slides.

The genus *Empetrum* is one of the three genera composing the family Empetraceæ, now generally considered to be most closely related to the Ericaceæ. *Empetrum* has a very wide but discontinuous geographic range. In the Northern Hemisphere it occurs almost everywhere above the latitude 40° N. In the Southern Hemisphere it is found in western South America below the latitude 35° S., throughout Fuegia and the Falklands, and in the Tristan d'Acunha island group.

The abundance of the genus throughout the greater part of its range has resulted in the collection of an unusually large number of specimens. Examination of these shows that the individual plants are by no means constant in character, but differ considerably among themselves. This variation is due chiefly to the differential development of seven important morphological characters, *i. e.* general habit, degree of hairiness, shape and size of leaf, arrangement of leaves, angle of leaf insertion, sex of flower, and colour of berry. There are certain other variable minor characters, but it is to these seven that the noticeable differences between individuals are due. Among these characters there are three distinct types of variation, which may be distinguished as "continuous," "compound-continuous," and "discontinuous."

It might be supposed that such variation would result in an enormous number of slightly and equally different forms within the genus. Actually, however, only a very few of the theoretically possible character-combinations occur, and any individual plant can be placed without hesitation into one, and only one, of ten perfectly distinct units. This feature is due mainly to correlated variation (the association of a particular condition in one variable character with a definite condition in some other character), but also to marked geographical segregation, especially in the more isolated parts of the generic range.

The generic constitution resulting from these phenomena is best expressed taxonomically by recognizing two distinct species, one with a subspecies, a variety and three forms, and the other with three forms.

The President expressed the appreciation of the meeting in referring to the attractive manner in which Mr. Good had expounded his subject.

Mr. J. T. Cunningham described, with lantern-slide illustrations, the nuptial pads of Frogs and Toads from the Lamarckian point of view.

The nuptial pads of the Common Frog, *Rana temporaria*, are thickenings of the horny epidermis on the inner sides of the fore-feet, or hands. The superficial layer of the epidermis is black and raised into papillæ. They are entirely absent in the female. It is evident that they give the male a firmer hold of the female in the axillary amplexus which precedes spawning. But from the Lamarckian point of view the question is not what is the function of a structure, but what is its cause; that is, what is the stimulus which could, on Lamarckian principles, have given rise to it? The author had been always impressed with the fact that there is no corresponding hypertrophy of the epidermis in the female skin with which the hands of the male are in contact. During the recent breeding-season he had carefully studied the animals in amplexus, and had found that, although the male's hands and nuptial pads are partly in contact with the skin of the female, they are also in contact with each other, and the more the female struggles the more tightly are the pads pressed together. There are bones beneath the pads, while the skin of the female, in contact with the hands, covers the soft abdomen and offers no resistance to pressure. He concluded, therefore, that the nuptial pads are in harmony with other secondary sexual characters in male animals in being related to mechanical stimulation, which is confined to the males. Photographs of the living animals were shown in lantern-slides in support of these statements, and the subject was discussed in relation to cases in other Anura and to the great *Alytes* controversy.

Professor E. W. MacBride, F.R.S., commented on Mr. Cunningham's references to Dr. Kammerer's researches, and referred to the latter's work in bringing about the development of a functional eye by appropriate stimulus in the cave-newt *Proteus* as strongly supporting a Lamarckian view.

Mr. R. H. Burne questioned how callosities could be developed as a result of function in frogs and toads in view of the relatively infrequent exercise of the function.

Mr. C. C. Hentschel also contributed to the discussion.

The following papers were read in title:—

Dr. B. M. Griffiths.—"The Phytoplankton of the Isle of Anglesey, and of Llyn Ogwen, North Wales."

Miss Isobel Dean, B.Sc.—*Ainigmaptilon haswelli*, n.g. et sp.; a new Alcyonarian type."

27th May, 1926.

Anniversary Meeting.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of 6th May, 1926, having been circulated, were confirmed.

Mr. Norman Boyd Kinnear; Mr. Fred Howarth, B.Sc.; Mrs. Eleanor Mary Hughes Gibb; Miss Eva Jennie Fry, M.Sc.; and Miss Helene Elizabeth Bargmann, B.Sc., were admitted Fellows.

Certificates in favour of Prof. John William Bews; Prof. William John Dakin, D.Sc.; and Arthur George Tansley, M.A., F.R.S., were read for the second time.

Miss Isa Martin, M.A., was proposed as a Fellow.

The Treasurer presented his Report and Cash Statement duly audited, which were received and adopted (see pp. 105–7).

The General Secretary reported that since the last Anniversary the following had died or their deaths had been ascertained, namely:—

Honorary Member.

Her Most Excellent Majesty Queen Alexandra, L.G.

21 Fellows.

Dr. William Bateson.
James Ebenezer Black.
Dr. Arthur Gardiner Butler.
William Norwood Cheesman.
Sir Francis Darwin, Kt.
Pyari Mohan Debbarman.
Dr. Harry Drinkwater.
James Sykes Gamble, C.I.E.
Henry Brougham Guppy.
John Robertson Henderson, C.I.E.
Rev. George Henslow.
William Philip Hiern.
Joseph Henry Maiden, I.S.O.
Frank Morey.
Dr. James Murie.
Sir Henry Alfred Alford Nicholls, Kt.
Sir William Schlich, K.C.I.E.
Leonard John Sedgwick.
Henry Charles Stone.
Alfred Osten Walker.
Miss Eva Whitley.

2 Foreign Members.

Dr. Jean Massart.
Prof. Georg August Schweinfurth.

That the following 13 Fellows had withdrawn:—

Sydney Frederick Armstrong.
Thomas William Brown.
Dr. John Wolfran Cornwall.
Alfred Denny.
William Rickatson Dykes.
Wilfrid Edward Hiley.
Miss Vera Adelaide Irwin-Smith.
Miss Nina Frances Layard.
Mrs. Marjorie Isabel Shiels (*née* Collins).
Mrs. Elaine M. Taig (*née* Rees).
John Taylor.
Capt. John Francis Donald Tutt.
Errol Ivor White.

That the following had been removed from the List of Fellows in accordance with the Bye-Laws, Chap. II. § 6:—

Miss Flora Amelia Gordon.
William Gerald Harding.
Dr. Edwin Percy Phillips.
Dr. V. V. Ramana-Sastrin.

During the same period 50 Fellows, of whom 46 have qualified up to the present, 2 Foreign Members, and 6 Associates have been elected.

The Librarian presented his Report for the past year as follows:—

The most important event of the year connected with the Library was the publication of the new authors' Catalogue, prepared by Dr. Jackson, with the assistance of Mr. S. Savage. It forms a volume of 860 pages and includes all additions during the last 29 years up to 1925.

The fitting up with shelving of one of the rooms on the top floor has relieved to a small extent the pressure for space in the main library, and there is still a considerable amount of shelving space available on the top floor. During the year 212 books, exclusive of periodicals, reprints, or continuations of works in course of publication, have been added to the Library. The total number of periodical publications received by the Society is now 634. The following table gives an abstract of an analytic census of these publications as regards their continent of production:—

	By Exchange.	By Gift.	By Purchase.	Totals.
Africa	13	5	—	18
Asia	35	37	1	73
Europe	238	78	74	390
North America ..	77	27	8	112
Oceania	11	12	—	23
South America ..	12	6	—	18
	386	165	83	634

Twelve new exchanges of publications have been established. A considerable number of donations of books has been received, and lists of such have been presented for inspection at each meeting of the Society. Amongst them was a large collection of books and pamphlets presented by Mr. A. D. Michael of Studland. The distribution of nearly a hundred free copies of the new catalogue of the Library to scientific societies and institutions throughout the world has been of benefit in so far as it has led to the filling up of some of the gaps in the Library. A large number of reprints has also been received. The amount expended on the purchase of books and periodicals was £289 12*s.* 10*d.*, of which £30 15*s.* 10*d.* was for books. The number of volumes bound was 436, at a total cost of £152 4*s.* 0*d.* or at an average cost of just under 7*s.* per volume. The number of volumes borrowed from the Library during the year was 1829. The stock of the Society's 'Journal' (Botany) has been arranged in order, but no progress can be made in the arrangement of the stock of the 'Journal' (Zoology) until storage racks are available. Once the stock of Journals is in order, it should be possible to prepare and keep a proper stock account and a proper sale-price list of all available volumes and parts of volumes.

The General Secretary having read the Bye-laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to ballot.

The Ballot for the Council having closed at 5.30, the President appointed Mr. E. T. Browne, Prof. R. R. Gates, and Lt.-Col. J. H. Tull Walsh, Scrutineers, who, having examined the lists and cast them up, reported to the President, who declared the result as follows:—

Edward Ashdown Bunyard, Esq.; Dr. Wm. Thos. Calman, F.R.S.; *Reginald Cory, Esq.; Arthur Disbrowe Cotton, Esq.; H. N. Dixon, M.A.; *Prof. J. Stanley Gardiner, F.R.S.; *Prof. E. S. Goodrich, F.R.S.; Dr. Robert W. T. Gunther, M.A.; Miss Ann Cronin Halkett; Dr. B. Daydon Jackson; Prof. E. W. MacBride, F.R.S.; Dr. D. L. Mackinnon; Horace W. Monckton, V.-P.G.S.; Dr. John Percival, M.A.; Reginald Innes Pocock, F.R.S.; John Ramsbottom, O.B.E., M.A.; Dr. A. B. Rendle, F.R.S.; *Dr. E. Stuart Russell; *Dr. E. J. Salisbury; and R. J. Tabor, B.Sc.

(New Councillors are shown by an asterisk. The retiring Councillors were: Dr. G. P. Bidder, M.A., Mr. R. H. Burne, Prof. F. E. Fritch, D.Sc., and Mr. L. V. Lester-Garland, M.A.; by death, Dr. William Bateson.)

The Ballot for the Officers having been closed, the President appointed the same Scrutineers, who, having examined the lists and cast them up, reported to the President, who declared the result as follows:—

President: Dr. Alfred Barton Rendle, F.R.S.; *Treasurer*: Horace W. Monckton, V.-P.G.S.; *Secretaries*: Dr. W. T. Calman, F.R.S. (Zoology); and John Ramsbottom, O.B.E., M.A. (Botany).

The President then delivered his Address, after which Mr. E. Heron-Allen, F.R.S., moved:—"That the President be thanked for his excellent Address, and that he be requested to allow it to be printed, and circulated amongst the Fellows," which, seconded by Mr. Robert Paulson, was put to the Meeting by the mover and carried by acclamation. (See pp. 57–65.)

The President having acknowledged the resolution, proceeded to address Dr. Edgar Johnson Allen, F.R.S., as follows, and handed him the Linnean Gold Medal.

Dr. Allen,—

The Council of the Linnean Society have awarded you the Linnean Medal because of the eminent services which you have rendered to biological science by your own researches, by the guidance and inspiration which you have given to younger workers, and by the wise and skilful administration of the great institution of which you are the head.

Your own investigations have always been marked by a touch of that originality which is so often lacking in so-called original research. From your earlier work on the nervous system of the embryonic Lobster, through a long series of faunistic and systematic papers dealing largely but not exclusively with the Polychæte Worms, down to your memoir on regeneration and reproduction in the Polychæte *Procerastea*, you have made noteworthy contributions to many widely different branches of pure Zoology. The number of papers on Fishery research that bear your name is no indication of the extent of your contribution to that branch of science; for it is no secret that a large part of the scientific fishery work in this country during the past thirty years has been done by men who, if not actually working under your direction, would be proud to call themselves your pupils.

While this medal is awarded to you as a zoologist, it is of particular interest to me as a botanist to recall your experiments on the culture of marine plankton diatoms, which have added a new method to the technique of marine laboratories and led directly to your remarkable discovery of the existence in natural sea-water of a vitamin-like substance which is essential for the growth of some of these diatoms.

Finally, during the time you have been Director of the Laboratory of the Marine Biological Association at Plymouth, you have made it one of the greatest institutions, if not the greatest, of its kind in the world, and you have created a school of marine research which has been an inspiration to the younger generation of workers in many fields.

The Award was suitably acknowledged by the recipient.

The General Secretary presented certain obituaries of deceased Fellows, Foreign Members, and Associates.

The President then called upon Sir David Prain, F.R.S., who, as Treasurer of a fund for a portrait of Dr. Benjamin Daydon Jackson, painted by Mr. Ernest Moore, formally presented it to the Society. Dr. D. H. Scott, F.R.S., also contributed some remarks, and the President accepted the portrait on behalf of the Society.

Dr. Jackson, in responding, pointed out that the Society was celebrating its 138th anniversary, and that the length of his Secretaryship was one-third of the life of the Society. He expressed his grateful sense of the kindness he had experienced during his long term of office, and hoped that in his new appointment he might still be useful to the Society.

10th June, 1926.

Dr. B. D. Jackson, R.N.O. (Sweden), Vice-President, in the Chair.

The Vice-President announced that he had been appointed by the President to take the Chair at the Meeting, as Dr. Rendle, owing to indisposition, was unable to attend. Dr. Jackson expressed the wish of the Fellows present for the speedy restoration of the President to health.

The Minutes of the Anniversary Meeting held on the 27th May, 1926, having been circulated, were taken as read, and confirmed. The list of donations received since the previous Meeting was read and laid on the table. The following Fellows were then admitted:—Edgar Ravenswood Waite (elected 1890), Iolo Aneurin Williams (elected 1926), Murray Ross Henderson (elected 1922).

The Vice-President in the Chair then announced that the President had appointed the following Fellows as Vice-Presidents for the Session of 1926–27:—Dr. B. Daydon Jackson, Prof. E. W. MacBride, F.R.S., Mr. H. W. Monckton, and Prof. John Percival.

Certificates were read, in favour of Miss Isa Martin, M.A., for the second time, and in favour of Ernest John Stream, M.A., for the first time. The following were balloted for and elected Fellows:—Macgregor Skene, D.Sc.; Ernest Victor Laing, M.A., B.Sc.; Charles Tate Regan, M.A., F.R.S.; Prof. John William Bews, M.A., D.Sc.; Prof. William John Dakin, D.Sc., F.Z.S.; Arthur George Tansley, M.A., F.R.S.

Captain J. G. Dollman (Visitor) exhibited the skin of a rabbit sent from Australia as an example of a supposed new "mutation." The specimen showed the fur thickly interspersed with what appeared at first glance to be "bristles" an inch or more in

length. The "bristles" were, in fact, the awns of an Australian grass of the genus *Stipa*, the fruits of which had implanted themselves in the fur of the rabbit.

The Vice-President in the Chair commented on the curious nature of the exhibit.

Mr. E. R. Waite observed that in some parts of Australia the fruits or seeds of various species of plants were apt to get caught up in the wool of sheep, particularly about the throat, and that seeds so captured not infrequently germinated there.

Mr. I. H. Burkill gave an account—illustrated with lantern-slides—of the vegetation found by him on lava surfaces of various ages in the crater of Kilauea, Hawaii.

Eight mature vascular plants from the surface of one-year-old lava in the crater of Kilauea, Hawaii, three being sedges and five grasses, were exhibited. Sedges: *Pycreus polystachyus* Beauv., *Mariscus cyperinus* Vahl, and *Fimbristylis diphylla* Vahl; grasses: *Paspalum conjugatum* Berg., *Digitaria pruriens* Trin., *Digitaria chinensis* Scop., *Sacciolepis indica* Chase, and *Sporobolus indicus* R. Br. These were found in cracks of the lava-flow of 1924 at places where steam issued. Within the steam-cracks was a moss of the genus *Trematodon*, its capsules weighted down with condensed water; algæ were observed, as well as a number of sporeling ferns and three small Dicotyledons, but none of them were mature enough for identification. It was very evident that the life of all these plants depended upon the moisture which the steam supplied.

On lava three years older isolated plants of *Vaccinium pendulifloruni* Gaudich. and *Cyathodes tameiameiæ* Cham. existed where, steam-cracks being absent, the surface was sheltered by boulders from the perennial north-east trade-wind. But neither of these two species, which seem to be the most xerophytic of the local plants, nor any other broad-leaved plants were observed upon the 1924 lava, which lava alone was hot enough to return rain as steam. It is the rarity of broad-leaved plants where the sedges and grasses were present which is of chief interest.

The crater of Kilauea is a side vent of the volcano of Mauna Rea, and has no sheltering walls upon the down-hill side. The wind has easy access to it; and between rainy periods it dries the surface. The drying is obviously a greater hindrance to encroaching vegetation than the sterility of the lava; and very numerous seeds must arrive upon the surface which fail to establish plants.

It is worth recalling in connection with the presence of grasses upon new lava in Kilauea that grasses have played a very great part in reclothing Krakatoa,—not in the number of species, but in the way in which the few that got there were relatively quick in taking possession of the whole mountain side, from which at the present time they are being ousted by the broad-leaved plants which have grown up through them.

Mr. H. N. Ridley stated that in Java and Sumatra he had seen no grasses on the volcanoes visited by him. The species he had seen farthest up any crater were xerophytic ferns of the genera *Polypodium* and *Litobrochia*, the plants forming a short turf. Probably there was not enough moisture in these Javan and Sumatran volcanoes to support a flora similar to that on Kilauea. He had seen *Imperata cylindrica* growing in sulphur smoke in a small crater. The grasses and sedges brought to Kilauea were wind-dispersed, widely distributed, and could grow almost anywhere.

Mr. H. N. Dixon mentioned, with reference to the occurrence of the moss *Trematodon* in steam crevices, that a species of that genus, *T. longicollis* Michx., which has a distribution in North America and Europe, occurs in the latter continent only under very similar conditions, being found in crater walls on the Island of Ischia and in the hot sulphur crevices of the semi-active Solfatara at Pozzuoli, near Naples. It was an interesting problem whether the peculiarity of *Trematodon* that enabled it to subsist in such conditions rested in the power of the spore to germinate or in the power of the gametophyte to develop. It was curious that the cosmopolitan *Funaria hygrometrica* had not appeared.

Miss Lorrain Smith pointed out that the colonizing of bare rocks was started in all parts of the world by lichens, followed by mosses and small flowering-plants. On Krakatoa the first plant to arrive was a blue-green alga, other plants following as debris collected.

Mr. J. Ramsbottom stated that bacteria and microfungi often preceded flowering-plants on sterile substrata, and, together with lichens, prepared the soil for them, and doubtless were present in the roots of the Ericaceæ mentioned as occurring on Kilauea.

Mr. T. A. Sprague suggested that the power of the Glumaceæ to produce adventitious roots would help to account for the greater spread of such species.

In reply, Mr. Burkill stated that there were excellent facilities for those who had the time and means to investigate the vegetation of the Hawaiian volcanoes along the lines suggested by the various speakers.

Mr. T. A. Sprague read his paper—illustrated by lantern-slides—on "The Taxonomic Position of the Adoxaceæ."

The taxonomic position assigned to *Adoxa* depends primarily on the interpretation placed on the two perianth whorls, those who regard these as "calyx and corolla" or "involucre and corolla" placing the genus near the Caprifoliaceæ, whereas those who regard them as "involucre and calyx" place it next the Saxifragaceæ or Araliaceæ. The interpretation of the normal or usual type of inflorescence and flower according to the "involucre and calyx" hypothesis involves fewer assumptions than are

required by the other hypothesis, and the evidence derived from abnormal or rarer types is greatly in its favour. A study of the external morphology of *Adoxa* seems to indicate that it has most in common with Saxifragaceæ, less with Caprifoliaceæ, and least with Araliaceæ. It is suggested that the Adoxaceæ should be placed in *Rosales—Saxifragineæ*, beside Saxifragaceæ.

Dr. Stapf suggested experimental investigation along the lines of Goebel and Klebs, by extirpating at a very early stage the lateral flowers. He pointed out that the Saxifragaceæ were a heterogeneous family, and enquired to which branch of it Mr. Sprague attached *Adoxa*. He also sought information as to the dispersal of the seeds.

Mr. T. A. Dymes pointed out that the apparent transverse dehiscence of the anther loculi in both *Adoxa* and *Chrysosplenium* seemed to indicate a relationship. He commented on the infrequency of fruiting in *Adoxa*.

In his reply, Mr. Sprague expressed the opinion that the Saxifragaceæ formed quite a natural group, and that *Adoxa* could be considered as nearest to *Chrysosplenium*. He suggested that the prevalence of *Puccinia* infection might explain the rapid dying-down to which the species was subject.

Mr. Ramsbottom expressed himself as disinclined to accept this as a valid explanation, inasmuch as the principal *Puccinia* infection that of *P. Adoxæ*, was constant, the mycelium perennating in the rhizome.

Mr. S. K. Mukerji gave an account of the Aquatic and Marsh Vegetation of the Dal Lake of Kashmir, illustrated with a series of lantern-slides of the scenery and of plant-associations. The author's abstract is as follows :—

1. This paper is the outcome of an ecological investigation of the plant communities of the Kashmir Himalayas, the work having extended over a number of years (from 1918–24).

It is divided into three parts :—

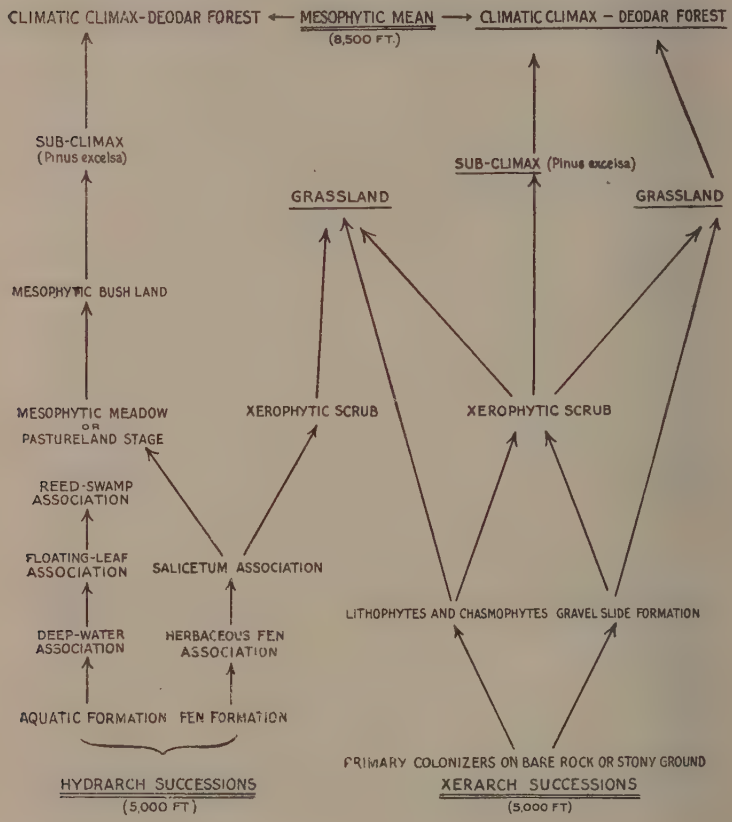
Part I.—The Aquatic and Marsh Vegetation of the Dal Lake of Kashmir.

Part II.—On the Plant Communities of the Temperate Region of the Kashmir Himalayas (from 5000–9000 ft.).

Part III.—The Sub-Alpine and Alpine Vegetation of the Kashmir Himalayas (from 9000–18,000 ft.).

2. The paper deals primarily with the course of development of the vegetation of the Dal Lake region of Kashmir and the various lines of succession in the Temperate Zone which culminate in the Mesophytic Climatic Climax—the Deodar Forest.

3. The normal course of development, according to the writer, is as shown below :—



The Chairman congratulated Mr. Mukerji on the interest of his paper and the beauty of his slides.

Dr. Stapf expressed his gratification that the investigation of the vegetation of Kashmir was advancing. He questioned whether the difference in corolla-colour mentioned incidentally by Mr. Mukerji was always due to variation within the species, and suggested that in some cases distinct species might be in question.

PRESIDENTIAL ADDRESS, 1926.

I TRUST that I am not given to boasting, but I think I have attended at least as many Anniversary Meetings of the Linnean Society as most of the Fellows present this evening—with, of course, one exception. I have always been impressed with the difference between the Ordinary Meeting and the Anniversary Meeting. In the former, interest centres in the Fellows who supply material for our edification and instruction, the President acting merely as umpire and time-keeper. At the Anniversary Meeting the rôle is changed, and the burden of maintaining the interest rests more immediately on the President. But I feel that my position this evening is a subordinate one, and that you are thinking of the old friend who for forty-six years has looked upon the assembled Fellows from his seat at the right hand of the President; a constant factor in the changing occupancy of the Officers' table. Dr. Jackson has been associated with thirteen Presidents (there have been only twenty since the foundation of the Society, but tenure of the office was longer in former days, and Sir J. E. Smith, our founder, held office for forty years), three Treasurers, and fourteen Secretaries—ten Zoological and four Botanical.

On April 3rd Dr. Jackson completed his 80th year, and to-day the curtain falls on the close of this long act in the history of his relation to the Society. But happily it is not the end of the play. In the next scene Dr. Jackson will reappear in a new character. As I announced at our last meeting, your Council has appointed him "Curator of the Linnean Collections." We shall not exact the full toll of attendance that we require from other members of the Staff, but Dr. Jackson will attend at times convenient to the Fellows to give help and advice to those wishing to consult the collections. These duties will not be very exacting, and Dr. Jackson will have leisure to put on record some of the knowledge of the Linnean treasures which he has accumulated during his long official association with the Society. We have been anxious lest by keeping him too long in harness as General Secretary we should risk the loss of much invaluable information which lack of leisure has prevented his recording for general use. But we are thankful that his continued vigour gives promise of a further period of useful work for and helpful association with our Society.

From to-day Lt.-Col. Gage, who has served for nearly two years as Librarian and understudy to Dr. Jackson, will assume responsibility as chief of Staff. He will for the present retain the two-fold title of Assistant-Secretary and Librarian.

Some explanation may be given of the disappearance of the office of General Secretary from the House-list which the Council submits for your consideration. This office was instituted in 1902 for Dr. Jackson when he took over the duties of the senior salaried officer, Mr. J. E. Harting, on the resignation of the latter.

Mr. Harting was Assistant-Secretary, and was not a member of Council. Dr. Jackson had served for twenty-two years as Botanical Secretary, that is, as one of the two Honorary Secretaries elected each year by the Fellows. The domestic affairs of the Society were not in a very satisfactory state at the time, and the Council gladly accepted Dr. Jackson's offer to take over the duties of the Assistant-Secretary, and at the same time acceded to his request that he should retain his seat on the Council with the title of General Secretary. Since then Dr. Jackson has been re-elected each year as a third secretary in addition to the two Honorary Secretaries. With Dr. Jackson's retirement the *ad hoc* office of General Secretary lapses and we revert to the position of 1902, but under much more favourable conditions. Some readjustment of the duties of the Staff will be considered by your Council in the coming Session.

Since our last Anniversary Meeting we have lost by death two Foreign Members—the veteran African explorer and botanist, Professor Georg August Schweinfurth, who was elected on May 5th, 1887, and was at the time of his death the senior Foreign Member; and Professor Jean Massart, the eminent Belgian plant-ecologist and Director of the Errera Botanical Institute, in Brussels, who was elected as recently as 1921.

In their place we have elected Dr. René Maire, Professor in the Faculty of Sciences, Algiers. Prof. Maire, the leading French mycologist, has employed modern methods of cytology and morphology in the systematic study of Fungi. Recently he has been appointed to his professorship at Algiers, and is now engaged on a general survey of the botany of the French Protectorate; and Dr. Wilhem Ludvig Johannsen, Professor of Plant Physiology in the University and Director of the Plant Physiological Laboratory in Copenhagen, whose work on problems of heredity is classic, and who is perhaps best known to the general botanist for his demonstration of pure lines in the flowering plants.

Losses by death among our ordinary Fellows include several who had far exceeded the allotted three score years and ten. A disadvantage of outliving one's contemporaries is that the memory of the man and his work has receded, and, save in exceptional cases, the news of his death excites little or no interest among the main body of workers. Perhaps I may therefore be permitted to recall some features of the life and work of these members of the older school who have recently left us.

Dr. James Murie was probably known to few only of the Fellows present, but for twelve years he was very active in the work of the Society, serving as Assistant-Secretary from 1876–80 and Librarian from 1880–88. His retirement was due to some difference of opinion with a senior officer. From then until his death, on Dec. 25, 1925, in his 94th year, he was a pensioner of the Society. After his retirement he rarely visited our rooms, and for many years past had lived in rigid seclusion at Leigh-on-Sea, Essex. The hermit-like existence of these years contrasted

strikingly with the activity of his earlier life. Having taken his M.D. at Glasgow in 1857, he was for a time Assistant in the Museum of the Royal College of Surgeons, and also served as Medical Officer to Petherick's Expedition to the White Nile, and made extensive natural history collections. Later he became Prosector to the Zoological Society, and the results of his investigations afforded material for numerous anatomical papers, especially on the higher vertebrates, which were published by the Zoological and our own Society. It is to be regretted that a certain incompatibility of temperament should have rendered ineffective an undoubted capacity for useful work.

The Rev. George Henslow, who died at Bournemouth on Dec. 30th last in his 91st year, was the son of John Stevens Henslow, Professor of Botany at Cambridge and the pioneer of practical elementary teaching in botany. Dr. (afterwards Sir Joseph) Hooker, who had married Henslow's sister, advised his father to keep George to Botany, in which he felt convinced there would soon be openings for competent men. For some reason this advice was not followed, and after a distinguished career at Cambridge, where he took first-class honours in the Natural Sciences Tripos and second-class honours in both Mathematics and Divinity, Henslow became ordained, and held in succession several scholastic appointments in addition to his pastoral charges. Subsequently he held various minor botanical posts in London, and was for many years Honorary Professor of Botany to the Royal Horticultural Society. Henslow was a good lecturer, and Fellows of my own generation will remember his communications to the Society as examples of clear exposition, fully illustrated by specimens and drawings (it was before the days of our electric lantern). But his views, though admirably expounded, were not well received. Existing plant-structures were, he held, the result of a direct action of the environment; and his somewhat didactic insistence on the merits of his own views as contrasted with those of Darwin encouraged criticism. He also attempted to explain the origin of Monocotyledons from Dicotyledons as the result of an adaptation to an aquatic environment. He was disappointed and rather hurt at the lack of appreciation accorded to his views by the scientific world. On the other hand, he found an appreciative audience at the fortnightly meetings of the Royal Horticultural Society, where he was a frequent lecturer, and there and elsewhere he did useful work in helping to popularize science. Towards the close of his life he was attracted to spiritualism.

William Philip Hiern, who had almost completed 87 years at his death, was a botanist of a very different type. Essentially a mathematician,—he was a high Wrangler and a Fellow of St. John's College, Cambridge,—he brought to the study of the taxonomy and bibliography of plants an almost mechanical precision. After leaving Cambridge he spent several years of active work under Hooker and Oliver at Kew, and elaborated many families for the African and Indian Floras, then in preparation. His

output of work in these few years was surprisingly large. The most important was a monograph of the Ebenaceæ, a family in which he retained his interest until the end of his life. A call to the family estate at Barnstaple, in North Devon, interrupted this period of active botanical work. He returned to London for a time some years later, working at the British Museum, where he compiled the elaborate account of Dr. Welwitsch's Angolan collections, and also contributed to the later volumes of the 'Flora of Tropical Africa.' In Devon he devoted himself to local and county work, especially educational and political. He had been for many years collecting material for a Flora of Devon, which unfortunately his passion for completeness never allowed him to publish. I last saw him in 1914, when, at the age of 75, he attended the British Association meeting in Australia. Those who were privileged to know him will retain a memory of a man of high character, and a precise and methodical worker of the old school.

Another veteran was Alfred O. Walker, who attained the age of 93. Up to about twenty years ago he was a regular attendant at our meetings and served on the Council from 1902–4. He was one of a band of Liverpool naturalists who was attracted by the late Sir William Herdman's marine work, and accompanied Sir William on one or more of his yachting expeditions off the N.W. of Scotland for oceanographical investigation. His special interest was Crustacea. For many years he had lived as a country gentleman near Maidstone, where he was keenly devoted to his garden and was well known in horticultural circles. We owe him our gratitude for a bequest of £200 to the Society.

Another benefactor by bequest has been Mr. Frank Morey, who was elected a Fellow in 1906. He was an active supporter of Natural History interests in the Isle of Wight, where, at Newport, he lived and died. He was part author of the 'Guide to the Natural History of the Isle of Wight,' Secretary of the Isle of Wight Natural History Society, and Hon. Curator of the Battenburg Memorial Museum, Carisbrooke. Several scientific and other societies benefited by his will, but his most fitting memorial was the bequest, to the National Trust for Places of Historic Interest or Natural Beauty, of Borthwood Copse, Newchurch, which he had bought for a bird sanctuary.

An eminent overseas botanist, Mr. J. H. Maiden, has left a record of a busy life's work on the Australian flora, the story of which is written in numerous floristic memoirs and the great herbarium which he has built up in the Sydney Botanic Gardens. Botanists who visited Australia in 1914 will remember him as an indefatigable host at Sydney.

Other Fellows eminent in their respective spheres whose death we have to record are Sir Francis Darwin, who in his younger days, when acting as his father's assistant, found time to serve the Society as Councillor; Sir William Schlich, the distinguished Indian Forest Administrator and, in later years, the reorganiser

of the Oxford School of Forestry; and his friend and fellow-worker in India, James Gamble, who after thirty years in the Indian Forest Service came home to continue his botanical work on the Indian flora quietly and persistently almost to the day of his death.

But our greatest loss has been the one still fresh in our minds—that of William Bateson, by no means an old man as we reckon the age of scientists, and apparently in the full vigour of his powers. His scientific work is too well known to need any comment here, but I would gratefully record his work for the Society, which he joined on coming to London in 1909 to take charge of the John Innes Institution at Merton. He took an active interest in our affairs, and his advice and experience as a Councillor were invaluable. We remember the interesting demonstrations he gave from time to time of some aspects of the work at Merton, and his vigorous intervention in many of our discussions.

Since writing the above, news has reached us of the death of Mr. Henry Guppy on board the S.S. 'El Kantara' at Martinique, on his way home from Tahiti, at the age of 71.

Like other eminent naturalists, Mr. Guppy started his career as a Surgeon in Her Majesty's Navy. The appointment in 1881 as Surgeon to H.M.S. 'Lark,' commissioned for service in the Western Pacific, gave him an opening, and during three years he worked at the ethnology, natural history and geology of the Solomon Islands; two subjects specially attracted him—the formation of Coral-reefs and the stocking of the Coral-island. Ten weeks on the Cocos-Keeling Islands in 1888 gave him the opportunity of developing his views on both subjects. He strongly opposed the subsidence theory suggested by Darwin as a result of a far less thorough examination of the same locality. Guppy's volume on Vanua Levu, Fiji (1903), was a further contribution to island geology. But of special interest to ourselves was his work on plant-dispersal, and especially the part played by fruits, seeds, and ocean-currents in building up island-floras and littoral floras generally. Briefly we may describe the years of his life as divided between work of observation in the islands of the Pacific and Atlantic Oceans and careful preparatory work at home. His two great works, 'Observations of a Naturalist in the Pacific' and 'Plants, Seeds, and Currents in the West Indies and Azores,' are records of years of careful observations, and serve as a mine of information for the student of problems of geographical distribution; they are both eminently suggestive. The award of our Linnean Medal in 1917 was a happy recognition of many years of untiring devotion to the pursuit of knowledge.

In addition to the two bequests by deceased Fellows, we have to thank two of our number, who desire to remain anonymous donors, for generous gifts in the past year.

The handsome chair which it is my privilege to occupy was the subject of much careful thought by the donor. It forms a

suitable centre-piece for the Officer's table, the gift of our former Treasurer, Sir Frank Crisp.

The matter of the subscription is sometimes a serious one in the case of young workers desirous of joining the Society. The way has been smoothed for one such by the generous gift from another Fellow of £100—who at the same time wishes to commemorate one of our Fellows, the late Professor E. A. Minchin, whose death in 1915, shortly after his election as Zoological Secretary, cut short a career of exceptional brilliance. The income of the fund is devoted to paying the Annual Contribution for a period of years of a young Student of Science who would not otherwise be in a position to become a candidate for Fellowship of the Society. The nomination is made by the President and the name of the holder is not publicly announced.

In my previous address I raised the question of the possibility of relationship between our Society and the numerous younger more specialised Societies. I have nothing definite to report, but I have been gratified to receive expressions of sympathy. There are obvious difficulties which I hope it may be possible to overcome.

We again have to thank our Honorary Secretaries for an excellent and varied programme during the past Session. An innovation which all will, I think, agree to have been a great improvement has been the printing in advance of abstracts of the papers. Fellows have no excuse for coming unprepared to discuss the subjects raised by the readers of papers.

We are indebted to three visitors for a descriptive account, in each case illustrated by an excellent series of lantern-slides, of widely distant and widely differing areas. Prof. Wood-Jones, of Adelaide, gave an account of the Fauna and Flora Reserve on Kangaroo Island, South Australia—an area of some 200 square miles recently set aside as a sanctuary by the Government of South Australia. You expressed your appreciation of the work in the form of a resolution which was transmitted to South Australia, where it appeared in the Press, and I have recently had a grateful acknowledgement of our help from one of our local Fellows. Another visitor, Mr. B. O. Coventry, entertained us with an account of Cashmere scenery and vegetation, and last month we spent an hour in the Swiss National Park under the guidance of Prof. Carl Schroeter, on the occasion of the fourth Hooker Lecture. I think Fellows were glad of the opportunity of a personal contact with one of the pioneers in the modern study of plant-ecology and to hear some account of the scheme, in the formation of which he has taken so active a part, for the preservation unspoiled of a characteristic portion of the Alpine flora and fauna.

Mr. Coventry's description of Cashmere vegetation raised the question of the need of a botanical survey of the area; and a somewhat similar question was raised by Mr. Frederick Eyles, an overseas Fellow of many years' standing, who signalised his first

visit to the Society's rooms by some remarks on the flora of Southern Rhodesia. He complained that the results of his study of the vegetation lacked precision owing to the want of a systematic botanical survey of the country, and pleaded for greater co-operation between the overseas worker and the Institutions at home. In this connection we are glad to welcome the appearance only a few days ago of the first part of a Flora of the Transvaal by one of our Fellows, Dr. Burtt Davy.

The pollination of the Primrose has been repeatedly discussed by our Fellows, and Mr. Marsden-Jones may be congratulated on having settled the point fairly satisfactorily in favour of diurnal insects.

Time will not allow of reference to other communications for which we express our thanks to our Fellows. Some have been notable as leading to interesting discussions. Mr. M. A. C. Hinton's paper on persistent growth in the Water-Vole raised an echo of the discussion on growth and death in the previous Session.

Discussion was also invited on Prof. Bower's scheme of phyletic grouping in Ferns and Dr. C. C. Hurst's account of his work on the nature and origin of species in *Rosa*; while Dr. Hamshaw Thomas's demonstration of his remarkably interesting discovery of the fossil group Caytoniales elicited a discussion during which sundry old hatchets were disinterred.

An interesting feature of some of our discussions has been a tendency to get back to first principles or definitions and to discover that what we had regarded as definite is, after all, vague. For instance, on the last-mentioned occasion the meaning of the term carpel was in question, and various authorities were quoted in support of differing definitions. The difficulty is that our terms were created to express certain conceptions, limited or general, and morphologists are apt to find themselves in a similar position to that of the present-day taxonomist in regard to the typifying of species—that is, the specifying of an individual plant in one herbarium as the *type*, by comparison with which other specimens must stand or fall. This is a simple matter when we are starting *de novo* and can put a definite label on the type-specimen of the species we happen to be describing. But it becomes difficult and often impossible in the case of species described in the past where the author gives no indication of a type or has advisedly based his description collectively on all the material available. And there are taxonomists even at the present day who consider this to be the most scientific method. But this raises the question of species, into which time forbids me to enter. I merely wish to suggest that in the matter of a definition, or type, we may attach to a given term, or specimen, a meaning which the originator never meant to convey.

Moreover, vague use of terms may engender vague ideas of relationship. Is it wearisome iteration to question the inclusion of the seed-like organs of Pteridosperms under the definition of seeds? What is the degree of importance of the differences between the

modern Seed, which claims priority for the term, and the organ characteristic of Pteridosperms? Have the latter advanced beyond the gametophyte stage? And does the fact that postponement of embryo-formation until after the freeing of the seed does occur, *e.g.* in Cycads, meet the objection? We may call absence of the embryo negative evidence; I suggest rather that it is absence of the criterion of the normal seed, which is an arrangement for the protection of the new sporophyte during a period of rest or transport; and the conditions governing the phases in the life-history preceding and accompanying germination must have been widely different in the two great groups. It does not detract from the interest and importance of the older group to emphasise the breadth of the gulf that separates it from the modern one.

Until Dr. Thomas described the Caytoniales we were clear as to what we understood by an Angiosperm. In our discussion on the group I think we got lost among our definitions in trying to explain a primitive structure in terms of modern structures with which from a morphological point of view it had little in common. Of supreme interest were what we may term the general tendencies. There was the angiosperm-idea, though we are left in the dark as to the nature of the contents of the seed-like structures. And associated with this early angiosperm-idea wind-pollination was indubitably demonstrated. And yet we are told that insect-pollination is "primitive" in the modern Angiosperm, and we must fain twist our systems of classification to find corners for every present-day anemophilous group.

On one point we are agreed—the entity, whatever may have been its origin, of the modern group of Angiosperms. Can we be as sure of our Gymnosperms? The tendency is to include under this heading everything with a seed or seed-like structure which is not an Angiosperm,—from Pteridosperms to Conifers. We are in danger of introducing a merely physiological or biological character into our systematics, and of recognising a mixed group which is not comparable with the well-defined group of Angiosperms.

One other point in conclusion. At the close of the 17th century, John Ray, in one of those moments of inspiration with which the patriarchs of botany were endowed, suggested the subdivision of the Flowering Plants according to the number of cotyledons, and founded the two groups—Monocotyledones and Dicotyledones. Linnæus, in his attempt at a Natural System, did not arrange his *Fragmenta* in groups above the grade of the family, and it remained for the Jussieus to group the Linnean *Fragmenta* under Ray's subdivisions, thus laying the foundations of a Natural System, from which our modern Systems have grown. The old systematists were not troubled by phylogeny, but the relationship of the Monocotyledons to the Dicotyledons has been in more recent years the subject of discussion by our Fellows. I recalled a few minutes since an attempt by George Henslow to derive the former from the latter as the result of

adaptation to an aquatic habit. Subsequently Ethel Sargant claimed to have established the origin of Monocotyledons from Dicotyledons as a result of adaptation to a geophytic habit; her view, in contrast with Henslow's, was based on a long series of careful investigations and was fruitful in encouraging others in the same line of work. Personally, I do not think either theory can be upheld. Since our last meeting, one of our Fellows, Dr. Agnes Arber, has published an admirable account of the Monocotyledons in which many points of interest are discussed; and I find myself in sympathy with the view to which she has been compelled—that the two groups are distinct and that there is no evidence for the derivation of one from the other. The problem of the origin of these two great subdivisions of Angiosperms, like that of the Angiosperms themselves and, I might add, of the modern Seed-plants, still awaits solution.

I remember a story told by the late Lord Avebury. He was walking with an eminent politician across the Park from Westminster one evening during an eclipse of the moon: "I suppose, Lubbock," said the politician, looking skywards, "that that's one of the things we shall never be able to explain." I trust that this does not represent my attitude to the problems of phylogeny to which I have referred. I am not pessimistic, but I think we need more spade-work and many more facts before we are able satisfactorily to solve them.

OBITUARY NOTICES.

William Bateson was born at Whitby in 1861 and was the son of the Rev. W. H. Bateson, D.D., Master of St. John's College, Cambridge. He was sent to Rugby and afterwards gained a scholarship at his father's college, and obtained a first in Part II. of the Natural Sciences Tripos in 1883. He was elected to a fellowship of St. John's in 1885. His first research work was embryological, but he soon turned to the problems of variation and evolution, which were to be the main studies of his life. He travelled widely from Northern America to Turkestan, amassing material which was afterwards utilised in his 'Materials for the Study of Variation' (1894). He had already begun work on the experimental study of Heredity when Mendel's forgotten work was brought to light, and Bateson became its chief champion in the somewhat acrimonious discussions to which it gave rise. A series of reports to the Evolution Committee of the Royal Society, published between 1902 and 1909, recorded the researches carried out by Bateson himself together with several of his pupils. In 1908 he was elected to the Chair of Biology at Cambridge which had been especially established for him, but in 1910 he resigned his professorship to become Director of the John Innes Horticultural Institution at Merton, where he created a world-famous school of research.

Bateson was elected a Fellow of the Royal Society in 1894, and was awarded the Darwin Medal in 1904 and a Royal Medal in 1920. He became a Fellow of the Linnean Society in 1909, and served as a Member of Council from 1916 to 1920 and again from 1923 to the time of his death. He was Vice-President in 1919–20 and again in 1924–25. A distinction that has not often been given to a scientific man came to him in 1922 when he was made a Trustee of the British Museum. He died at Merton after a very brief illness on the 8th February, 1926.

The following appreciation of Bateson's scientific work has been written by Professor T. H. Morgan, Columbia University, New York, a foreign member of the Society. [W. T. C.]

Bateson's span of life carried him through one of the most interesting transition periods in the history of biology. In his earlier Cambridge days he was surrounded by the influences of the school of the phylogenetic and descriptive embryology of which Francis Balfour was the recognized leader in the English-speaking world. Bateson's three contributions to the development of *Balanoglossus* (1884–5) show how he reacted to these influences.

At this time Darwin's teachings had become generally accepted, and while under their influence Bateson became interested in the "species question," as it is sometimes called. His two visits to the United States (1883–4) brought him into personal contact with W. K. Brooks, who, as a profound student of Darwin, had developed individual views concerning heredity and variation.

Bateson has recorded in his contribution to Brooks's biography the inspiration he received from his conversations with Brooks, who persuaded him that variability and heredity are not axioms but problems. Bateson began to collect data bearing on variability. The outcome of his extensive reading and observations appeared in his well-known book on the 'Materials for the Study of Variation.'

When Mendel's paper of 1865 was rediscovered (1900), Bateson, who had already begun to study the inheritance of variations that are discontinuous, realized, perhaps more than any other zoologist or botanist of the time, the far-reaching significance of Mendel's work—significant not only because of the discovery of segregation, but as a contribution to method that was to have revolutionary consequences in the study of heredity. Bateson at once threw himself with enthusiasm into the discussion that arose as to the importance of Mendel's teaching, which he feared might be overlooked or set aside through the influence of the school of biometry which was supposed to carry on the Darwinian traditions. His anticipation of coming events has been confirmed, but his fears that the significance of Mendel's work would be overlooked have proven unfounded. It is difficult for us to judge to-day as to how far this possible catastrophe was averted by Bateson's vigorous, not to say violent, attack on Weldon as representative of the biometrical school; but there can be little doubt that the re-publication (1902) of the translation of Mendel's paper (that had appeared in the 'Journal of the Royal Horticultural Society,' 1900), together with Bateson's reply to Weldon, went far towards bringing the question to a sharp issue. More important, in my opinion, was the actual work on heredity that Bateson and his collaborators, more particularly Miss Saunders and Punnett, published (1902–1909) in the Reports to the Evolutionary Committee of the Royal Society, which had granted subsidies for the work.

The two outstanding contributions that one associates to-day with Bateson's publications, apart from the large number of more special discoveries in the field of Mendelian heredity, are found in the Introduction and Concluding Reflections of the volume of 'Materials for the Study of Variation' and in the Yale lectures on 'Problems of Genetics.' Perhaps to them should be added the Cambridge Inaugural Address and his brilliant speculations and suggestions in the Australian Addresses as President of the British Association. To the questions raised there relating to "species," and to natural selection, we may first address ourselves, since they have an interest wider than the specific problems relating to Mendelian inheritance. They seem to have been ever present in the background of Bateson's thought. That this should be so, seems natural when we recall the serious attention Bateson had given to discontinous variation in his earlier work.

In the 'Materials' the problem of species is brought into the foreground, although the bulk of the volume is made up of data

dealing with discontinuous variations of many sorts, whose bearing on species-formation seems to be for the most part somewhat remote. In fact, Bateson's dictum that the first duty of the naturalist was at that time to collect data bearing on variability led him to include an array of materials that we now realize has many different interpretations—in large part being accidents in development rather than the result of modifications of the germinal material. It may be that the realization of the impossibility of distinguishing these kinds of variability from each other in "collections" spurred Bateson on to the study of the inheritance of variations, clearly discontinuous. In fact, as stated above, he had undertaken investigations of this sort before Mendelism came to the front.

Bateson's discussion of the relation of species-formation to the theory of natural selection has always interested me greatly. I have been much puzzled to discover where the contradictions on which he laid so much emphasis lie. Unless one keeps in mind the somewhat special and historical point of view that Bateson ascribes to all those who called themselves Darwinians, it is impossible to unravel what may seem to modern students the rather tortuous course of his arguments. While there can be no doubt that the central difficulty on which he lays so much emphasis was, at the time, a real stumbling-block, I do not think that it now offers any substantial difficulty, but can be given a rational, even if theoretical, solution; nor do I think it is a difficulty inherent in Darwin's own views if interpreted liberally. These statements call for further elucidation.

The root of the difficulty that troubled Bateson is to be found in the title of Darwin's book, which was 'The Origin of Species by Means of Natural Selection.' Bateson's chief contention, if I understand him, is that the theory of natural selection does not explain the distinctive feature of species, because their distinctiveness rests on characters that seem often to be trivial, but are nevertheless constant. How, he asks repeatedly, could species be created by natural selection if those parts that distinguish related species from each other are concerned with parts not essential to the life of the individual. This undoubtedly raises a serious question for Darwin's theory if Bateson's views regarding species are accepted, but I venture to think that it is not so serious otherwise. In the first place it is to be remembered that while Darwin entitled his great work 'The Origin of Species,' the whole argument went to show that the attempt sharply to separate species from varieties is futile, because in most cases there is no such sharp distinction. If this is conceded, then natural selection may be an approximate solution of the situation as it exists. But Bateson takes a different view in regard to species, and believes that there are distinctions, essential ones, that give species a particular hierarchy in the scale of organic life. Paradoxical as it may seem, the principle of discontinuous variation, for which Bateson so ably contended, has

always seemed to me to furnish a possible solution of the very difficulty that Bateson has emphasized, namely that some species, at least, are sharply separated by constant characters that seem not important for their existence. I refer to the discovery that genetic factors affect, as a rule, many parts of the body at the same time. Now, if some of these effects involve the physiological actions of organs essential to the individual's existence, other structural effects will be expected to occur that are no less constant, even though trivial. Natural selection having "fixed" the former will incidentally include the latter. The argument is no longer an appeal to ignorance, which Bateson says is so often resorted to in support of the theory of natural selection, but an appeal to an established fact. Its implications only are theoretical.

There are two other problems intimately bound up with Bateson's argument concerning the species question, namely the origin of infertility between species, and the sterility of hybrids produced by species crosses. Both questions were much discussed by Darwin with a fullness of information and open-mindedness never since surpassed. Personally, I believe he practically met the requirements of the situation. Recent work substantiates, I think, the essentials of Darwin's argument. The difficulty raised by Bateson may seem to deal the mutation theory of evolution a harder blow than Darwin's theory, if only because the mutation theory demands a more objective and rigorous answer than one that might have seemed to suffice in Darwin's time. The points raised by Bateson are the following:—If mutants are incipient species, we should be led to expect that some of them would be infertile with the parent species but fertile with their own kind, for these are the most distinctive feature of species. If not present in a single step, what reasons can be given for supposing that more steps will lead to infertility? That this point is well taken, no one familiar with the mutation process is likely to deny. The tables might be turned perhaps by stating that when such a mutation does occur it will give rise to a new species, in the sense defined. But such a counter argument would be foolhardy, both because it concedes too much to the restricted definition of species and also because it appeals to something not yet observed. It is true that Plough has recently discovered a case in which a mutant type appeared that is more fertile with others of its kind than with the parent type, but a single case of this sort, not yet fully reported, is a dangerous precedent to appeal to. The point that Bateson made was, I believe, well made. It may, after all, only mean waiting, as Bateson realized, to see whether such infertile mutants may turn up. One possible source of hopefulness may, at least, be pointed out. Practically all the cases of mutant changes that have been observed and studied relate to external characters that might not have had anything to do with physiological functions causing infertility. Only if they happened to have been correlated with cross-infertility would

they be expected to give rise to new species with this particularity. In other words cross-infertility in its incipient stages may be exceptional rather than the rule. Moreover, if a mutant individual should appear that was infertile with the parent type, it is not likely that it could be, or even would be, tested at the time with one of its kind, etc. Bateson intended, no doubt, that the point he raised should not be one of carping criticism—he was singularly free from raising a question in this spirit,—but rather that it might lead to observations in a direction that would bear on the question at issue.

The second point that Bateson has emphasized may be quite unrelated to the former one. He calls attention to the fact that sterility, which is generally regarded as a decisive feature of specific distinction, has not been observed for any new types that have a known or presumptive mutational origin when mated to the parent type.

Now it is generally known that hybrid sterility is a very variable condition. It has been shown in a number of cases to result from failure of the conjugation of the chromosomes at maturation which leads automatically to great subsequent mortality amongst the germ-cells. If it be granted that in the course of evolution, changes in the constitution of the chromosomes occur, or else in the re-arrangement of the elements (as we now have demonstrable evidence may occur), there would be no difficulty in understanding why the hybrid is in such cases sterile. But this again raises a new question of a different sort from that relating to the origin of species by point mutations; for it is point mutations that one has in mind in the above comparisons. We can only conclude at present that, in so far as hybrid sterility rests on imperfections in the ripening process, it may be traceable to differences that have involved changes in chromosome numbers, or re-arrangements. Evidence is coming in at present that promises to supply materials for the study of this problem, and we can afford to wait awhile before making the sterility of the hybrid a fatal objection to the theory of natural selection through mutational changes.

Of the public addresses given by Bateson, the Inaugural Lecture delivered at Cambridge in 1908 on his appointment there to the new Professorship in Biology is in some respects the most interesting. He put the essential facts of the new work on heredity before a general academic audience with a vigour that makes it good reading still. In it occurs a statement that may be quoted both on account of its intrinsic interest and also because it typifies Bateson's general attitude towards genetics:—"Treasure your exceptions! When there are none, the work gets so dull that no one cares to carry it further. Keep them always uncovered and in sight. Exceptions are like the rough brickwork of a growing building which tells that there is more to come and shows where the next construction is to be."

The Herbert Spencer Lecture (1912) on 'Biological Fact and

the Structure of Society' is, in the main, a warning to the eugenists that our present knowledge of Mendelian principles tells us not to make hasty generalizations as to human society, for "let us remember that a polymorphic and mongrel population like ours descends from many tributary streams. We are made of fragments of divers races, all in their degree contributing their special aptitudes, their special deficiences, their particular virtues and vices, and their multifarious notions of right and wrong. Many of us have, for instance, the monogamous instinct as strong as pigeons, and many of both sexes have it no more than fowls. Why should some be ambitious to make us think or act alike? It is much better that we should be of many sorts—saints, nondescripts, and sinners."

Again he gives warning:—"Before science can claim to have any positive guidance to offer, numbers of untouched problems must be solved." "For these and other reasons I am entirely opposed to the views of those who would subsidize the families of parents of those passed as unexceptionable. Galton, I know, contemplated some such possibility; but if we picture to ourselves the kind of persons who would infallibly be chosen as examples of 'civic worth'—the term lately used to denote their virtues—the prospect is not very attractive. We need not for the present fear any scarcity of that class, and I think we may be content to postpone schemes for their multiplication."

Bateson gives emphatic notice, unpalatable to propagandists in general and to eugenists in particular, who take for granted that the "standard of perfection" is known to them, that any attempt to interfere with the course of human heredity, except in the "segregation of the hopeless and unfit," carries with it the implication that the end to be desired is obvious, while, in reality, in such a complex biological, social, and economic group as human society the opportunity for serious blundering is too great to put the future "structure of society" in such hands*. I cannot resist the temptation for one further quotation from this address, because it makes clear a relation that is often overlooked by novices in the theory of natural selection. Darwin himself fell into no such error concerning the "survival of the fittest." Bateson writes:—"I lay stress on this aspect of the social problem because I have seen several times of late the claim put forward that the teaching of biological science sanctions a system of freest competition for the means of subsistence between individuals, under which the fittest will survive and the less fit tend to extinction. That may conceivably be a true inference applicable to forms which, like thrushes, live independent lives; but so soon as social organization begins, the competition is between societies and not between individuals. Just as the body needs its humbler organs, so a community needs its lower grades, and just as the

* In this connection Bateson said in his Sydney address: "If some fancier with the catholicity of Shakespeare would take us in hand, well and good, but I would not trust even Shakespeares meeting as a committee."

body decays if even the humblest organs starve, so it is necessary for society adequately to ensure the maintenance of all its constituent members so long as they are contributing to its support."

It is difficult to give an adequate account of the Australian Addresses in a few words; there is so much that is excellently put with an abounding humour. The first, or Melbourne address, is a clearly-reasoned statement of the standpoint of the modern geneticists as interpreted by Bateson. He gives a somewhat more complete view of his attitude towards natural selection, pointing out that from what we know of the distribution of variability in nature the scope claimed by natural selection in determining the fixity of species must be greatly reduced. "The doctrine of the survival of the fittest is undeniable so long as it is applied to the organism as a whole," . . . "but to see fitness everywhere is mere eighteenth-century optimism." . . . "Shorn of their pretensions, the doctrine of the survival of the favoured races is a truism, helping scarcely at all to account for the diversity of species." Here we find the admission that natural selection may account for "the organism as a whole" and for "favoured races," but "scarcely at all" for the "diversity of species," which is somewhat vague; and when all is said, it is not so different from much that Darwin himself was contending for. Bateson says at the conclusion of his address that it is with reluctance and rather from a sense of duty that he has devoted so much of his report to the evolutionary aspect of genetic research, the outcome of which is negative, "destroying much that till lately passed for gospel."

The Sydney address extends some of the conclusions reached in the previous address to "our own species, Man." It covers much the same ground as the Spencer Lecture. Like the latter it is rather pessimistic in tone, but is full of suggestion, good sense, and pointed criticism. Its final recommendation, which is a little too general for daily use, is to suggest to reformers that they should direct their efforts toward "facilitating and rectifying class distinction" rather than to abolishing it, because, Bateson believes, the teaching of biology is "perfectly clear" that Man is essentially at present polymorphic and that men are born unequal. In a word, the main differences are genetic and not environmental.

Several years later (Dec. 28, 1921; 'Science,' Jan. 20, 1922, vol. lv.) Bateson made another address before the American Association at Toronto that caused in Canada and the United States wide criticism and comment. In point of fact, the address contained little that he had not previously published, but this time it reached a less enlightened public, and was reported in the papers in a garbled account. It would not be necessary to dwell on this episode were it not that it received attention also from some of the old-school naturalists who rushed to the defence of the evolution theory that Bateson seemed (to them) to have attacked. Curiously enough, men who had themselves rejected

Darwin's theory of natural selection as insufficient were the severest critics of Bateson on the grounds, I suppose, that he had unwittingly given away the case for evolution. It is needless to point out that he had stated the case for evolution with extraordinary lucidity, and was quite above juggling with the "facts" and the "causes" of evolution.

It is with some hesitation that I take up Bateson's attitude toward the chromosomes as the material bearers of the hereditary units, because his point of view was for a long time diametrically opposite to my own. Bateson committed himself rather fully in his Melbourne address (1914) when he said in reference to the sorting-out of the "elements or factors" by a process of cell-division :—"What these elements, or factors as we call them, are we do not know. That they are in some way transmitted by the material of the ovum and of the spermatozoon is obvious, but it seems to me unlikely that they are in any simple or literal sense material particles. I suspect rather that their properties depend on some phenomenon of arrangement."

Nevertheless, when he published his review of our book on the 'Mechanism of Mendelian Heredity' he gave it fair treatment. Later still, after a visit to the Columbia University Laboratory, where we showed him so much of our evidence as time allowed, he made very handsome acknowledgements of his appreciation of that evidence. He was convinced at least of the value of the evidence, though he held still many reservations, more especially concerning the interpretation of crossing over; but he never completely realized, I think, that in accepting the chromosomes as the bearers of the genes there remains no alternative but to accept the fact that crossing over must result from an interchange between them, even although there may be still room for a wide difference of opinion as to the particular way in which this takes place.

Despite the valiant attempts Bateson made to give as much credit as he honestly could to the chromosome theory, it is clear from his posthumous paper ('Journal of Genetics,' xvi. Jan. 1926) that the evidence on which the theory is based was not congenial to his way of thinking. He states that "the work of the Columbia school has shown beyond possibility of doubt that in animals the reduction division must be the moment at which segregation in respect to Mendelian factors is usually affected." Nevertheless he adds: "at least in plants of many kinds comparable segregations occur at somatic divisions also." I should want to quality the latter statement; for, some of the cases cited by Bateson in plants are capable of a different interpretation, while for others the interpretation is very problematical and not certainly due to segregation. It is unnecessary to affirm that segregation, like the typical Mendelian process, may never be found to occur in somatic tissues of animals as well as plants; but the evidence at present does not, I think, require this interpretation, while there is much evidence that the typical process

of segregation both in animals and plants occurs at the time of reduction of the chromosomes. Bateson also states that "if we press for a more exact account of the nature of the association subsisting between factors and chromosomes, no answer is forthcoming." I must dissent also from this somewhat positive statement; for we have at least supplied an abundance of data that we think answers the question. Whether the answer is right or wrong the future alone will decide.

Bateson reviews in his last paper, under the heading of "Anisogeny," some of the interesting problems that have grown out of the work of the Institute at Merton. His discussion of chimæras, especially those arising from root-buds of Pelargonium, is full of suggestion. The paper ends with a further shot at the "extension and implications" of the chromosome theory. In plants, he again affirms, phenomena are met with to which the simple chromosome theory is inapplicable, and "the conviction has grown that the problem of heredity and variation is intimately connected with that of somatic differentiation." In these respects the chromosome theory "has fallen short of the essential discovery." Here once more I find my point of view miles apart from that of Bateson. If by "the essential discovery" he had meant the connection between the postulated genes and the differentiation of the cells of the embryo, then no one would deny that we are still much in the dark; but the whole context of his statement cannot be interpreted to mean this. There is no need to dwell on these points on which we disagree so radically, for there is so much on which we could agree that it is an easy and delightful task to join with his other friends and admirers in praise of the career of a man who "fearless in criticism and generous in appreciation, stood above all for the spirit of freedom in inquiry through which alone the world may progress to better things."*

[T. H. Morgan.]

James Ebenezer Black was born at North Berwick on 1st October, 1865, but spent his boyhood in Manchester, and later at Peebles, where he learnt the craft of making tweeds, and set up as a manufacturer, but retired from business about the beginning of the present century to devote himself to scientific pursuits.

He had a keen interest in entomology from his early years, at first as a lepidopterist, later and chiefly as a coleopterist, collecting a fine series of British beetles. Last year he spent six weeks at Brockenhurst, in the New Forest, leaving for Peebles in his car on the 7th July: but on the second day of his journey, near Ludlow, he was taken suddenly ill, and was removed to the local hospital; he rallied from his first attack of angina pectoris, but a second and more severe attack supervened, and he passed away quietly on Friday, 10th July.

His friends described him as modest and unassuming, and generous in sharing his practical experience, and a delightful field

* "Obituary," 'Nature,' lxvii. 1926.

companion. He joined the Entomological Society in 1904, and his election into our Society took place on the 20th February, 1913.

The details of the previous lines have been derived from a sympathetic sketch in the 'Entomologist's Monthly Magazine' for last September. [B. D. J.]

Dr. Arthur Gardiner Butler, who died 28th May, 1925, at the age of nearly 81, was born at Chelsea on 27th June, 1844. He was the son of Thomas Butler, formerly Assistant Secretary at the British Museum, who sent him to St. Paul's School and later, at the age of 17, to the South Kensington Art School, where he gained a bronze medal for excellence in draughtsmanship. In 1863, when he was but 19, his father secured for him an assistantship in the Zoological Department of the British Museum, and in 1879 he was appointed Assistant Keeper under Dr. Günther, who gave him special charge of the collections of Arthropoda. But he was very frequently absent from his duties owing to ill-health, partly real and partly, it was thought, imaginary, and retired in 1901 before the completion of his forty years' service.

During the tenure of his assistantship at the Museum, he devoted himself mainly to the study of butterflies and moths, and published a large number of useful memoirs on this order of insects, the most extensive being a 'Catalogue of the Satyridæ,' a 'Catalogue of the Diurnal Lepidoptera described by Fabricius,' 'Lepidoptera Exotica,' and a catalogue of the typical specimens of Lepidoptera Heterocera in the collection of the British Museum. But his real interests were centred in birds rather than in butterflies, and his spare time was given to aviculture and to the writing of books on cage-birds and British birds and their eggs, with which he was intimately acquainted.

On leaving the Natural History Museum in 1901, he began a life of practical retirement at his home in Beckenham, and, entirely abandoning entomological work, devoted himself to his recreations of listening to his gramophone, of reading mainly such literature as the illustrated magazines afforded, and to his two natural history hobbies—his garden and his cage-birds. He kept in touch, however, with the Avicultural Society, writing periodically for the magazine and occasionally venturing to London to attend meetings of the Society. These visits, however, were infrequent, largely on account of his nervousness about street accidents in London. He was always most genial and pleasant, and delighted in hospitality to his friends. He was unfitted by temperament for any position of authority such as he held at the Museum, and, while he gained the esteem of his subordinates, his administration was not conspicuously successful.

He was a Fellow of the Zoological and Entomological Societies and a member of the British Ornithologists' Union. He was also an honorary Ph.D. Nevertheless, he had never received any

scientific training in the accepted sense of the term, and his zoological work was of the superficial kind frequently produced by those whose tastes are restricted to such groups as butterflies or birds and their eggs. When he was a member of the zoological staff of the British Museum, it was his misfortune to be compelled to undertake the identification of tracheate arthropods of all classes, including Myriopoda and Arachnida, of which he knew very little. It is needless to particularize the amusing errors he fell into, because under the circumstances he can hardly be held responsible for them. [R. I. Pocock.]

Francis Darwin (1848–1925). The Linnean Society has a peculiarly intimate association with the family of Charles Darwin, as it was at a meeting in the Society's rooms that the first pronouncement on Natural Selection was made by Darwin and Wallace, men who demonstrated that the love of truth is sometimes a very real factor in determining action, and set a standard of nobility of character which makes even a stronger appeal than the ability of the two authors. Through the death of Francis Darwin on 19th September, 1925, the contact between the Society and the Darwin family was, temporarily let us hope, broken. Francis Darwin, the third son of Charles Darwin, was born at Down on 16th August, 1848. In 1870, as an undergraduate of Trinity College, Cambridge, he obtained a first class in the Natural Sciences Tripos and, after completing his medical course at St. George's Hospital, took the M.B. degree. He never practised, but, fortunately for biological science, he became his father's secretary and assistant at Down. On the death of Charles Darwin, Francis removed to Cambridge and was elected a Fellow of Christ's College, where his father had spent three not too strenuous years as an undergraduate. Francis was subsequently elected an Honorary Fellow of the College. From 1884 to 1888 he was University Lecturer in Botany at Cambridge, and in 1888 he succeeded his friend, Dr. Vines, as Reader in Botany, and held this post until 1904. I shall always remember with pleasure attending Darwin's lectures on Plant Physiology: on one occasion at the close of a lecture I asked him some questions, and to my surprise and delight he assured me that he had not the slightest notion what the answers should be. This unusually frank confession made a deep impression; it was, as I afterwards discovered, a particularly attractive attribute of the man. He abhorred all kinds of artificiality and insincerity, and not infrequently surprised people by his vehemence in professing little or no knowledge on matters upon which others in his position would feel called upon to give an evasive reply or, possibly, a pontificial utterance. Darwin was in some respects an attractive lecturer: he never enjoyed lecturing, and no one would speak of him as in any sense a great exponent, but one listened to him with real pleasure because of his personality and not because of his art or skill as a lecturer. He was refreshingly informal, and talked to his audience

as a fellow-student and not as a superior person imparting instruction.

Cambridge owes to Francis Darwin the foundation of the School of Experimental Plant Physiology, which has now a well-deserved reputation in the scientific world. He also for some years gave the botanical lectures of the course on Elementary Biology taken by medical students; it was these lectures that formed the foundation of his 'Elements of Botany,' a book distinguished by a welcome departure from the almost exclusively morphological treatment adopted in most text-books of that period. It is beyond the scope of this sketch to give a list of Darwin's researches: his own work was to a large extent supplementary to, and inspired by, that of his father. His aim was to furnish experimental evidence in support of views which had been based on observations lacking the precision demanded by the standard of the school of Sachs, in which Darwin had served an apprenticeship. For many years and up to the time of his last illness Francis Darwin devoted much time to observations on the opening and closing of stomata. He was an enthusiastic and ingenious experimenter, fertile in invention, and, like his father, fond of simple contrivances and home-made apparatus. As President of the British Association at Dublin in 1908, he gave a stimulating address on the movements of plants, and discussed problems relating to stimulus and reaction with special reference to unconscious memory.

By most scientific men Darwin will be remembered as the biographer of his father: the 'Life and Letters of Charles Darwin' is one of a small number of thoroughly satisfactory biographies in the English language. The publication of 'More Letters' in 1903 was the result of a careful selection from a large mass of available material, and, as I had the privilege of acting as assistant editor, I am able to bear testimony to the care with which he did his part. At the Darwin Celebration at Cambridge in 1907 the Honorary Degree of Sc.D. was conferred upon Francis Darwin: it is a rare event for a Cambridge man to receive an Honorary Degree from his own University, and the exception to the usual practice met with whole-hearted approval.

Francis Darwin was the author of two volumes of essays—'Rustic Sounds and other Essays' (1917) and 'Springtime and other Essays' (1920). In these books he ranged over a wide field, recalling experiences in early years, talking in his inimitable style, never dull, and humorous in the richest sense, of his various hobbies, particularly music and old musical instruments. He had a happy knack of choosing just the right word, which is often as unexpected as it is fitting.

It was my good fortune to enjoy the friendship of Francis Darwin for over forty years: I owe much to the encouragement received from him as a teacher and a colleague, but I owe a great debt to him for the influence of his humanity. He was one of the most lovable men I have known: he was always absolutely

natural; he won the hearts and confidence of those who served him as well as those with whom he worked. His repugnance to any suggestion of insincerity, though sometimes disconcerting to those to whom subservience to the conventions of society is stronger than the love of truth, was one of his most attractive characteristics. In him were combined the true instincts of a naturalist and a devotion to experimental science. He received many academic honours: he was awarded the Darwin Medal by the Royal Society in 1912, and in 1913 a Knighthood was conferred upon him. He achieved fame and distinction by his contributions to natural knowledge, but it is the man himself whose qualities of the heart we recall most vividly and gratefully.

[A. C. Seward.]

Peary Mohon Debbarman, a younger son of the late Mr. R. M. Debbarman, a Judge of the Chief Court of Tippera State in Bengal, was born at Agartala on the 6th February, 1887. He was educated at Agartala Umakanta Academy and the Presidency College, Calcutta. After taking his B.Sc. degree with distinction at Calcutta, Mr. Debbarman studied law for some time, until in 1913 he was appointed to act as one of the two Assistants for Systematic Botany in the Botanical Survey of India, being later on confirmed in the post.

His work lay almost entirely in the Herbarium of the Roya Botanic Garden, Calcutta, of which he was officiating Curator at the time of his death. He was a most industrious worker, and had acquired an extensive knowledge of Indian plants, which he was always ready to place at the disposal of any who sought his aid. His quiet and unassuming manner and amiable character called forth the esteem of all who knew him. The heavy routine work unavoidable in such an insufficiently-staffed Herbarium as that of the Calcutta Garden has always been, allowed him very little time for research, but he contributed several papers to the Bombay Natural History Society's Journal and to the 'Journal of the Indian Botanical Society,' and was engaged in completing the systematic part of the Catalogue of the Royal Botanic Garden that had been begun by the writer.

His health gave way in 1924, and despite a change of scene, the end came while he was a patient in King George's Hospital at Lucknow, on the 8th January, 1925. He left a widow and seven children.

[A. T. Gage.]

Dr. Harry Drinkwater, F.R.S.E., was born in 1855, graduated M.B., C.M., and M.R.C.S. in 1877, and M.D. Edinburgh (Gold Medallist) in 1885. He practised first at Sunderland, afterwards removing to Wrexham. In 1908 Drinkwater published his first important paper, "An account of a Brachydactylous Family," in the 'Proceedings of the Royal Society of Edinburgh,' xxviii. pp. 35–37, figs. 11, which confirmed the conclusions of Farabee in 1905 in America that Brachydactyly or Short-Fingeredness in Man is

inherited as a simple Mendelian dominant character. This paper was particularly valuable and important, in view of the opposition to the Mendelian Principles of Heredity in this country at that time.

On the 3rd February, 1910, Dr. Drinkwater was elected a Fellow of our Society. Several later papers presented the results of careful anatomical investigations of brachydactylous hands and feet, with numerous radiographic figures and skiagrams which clearly illustrated the true nature of the various forms of brachydactyly in Man. In 1911 a paper on "The Inheritance of 'Thumb-Fingerness'" appeared in the 'Mendel Journal,' pp. 20, pls. 6, figs. 15. In 1912 an "Account of a Family showing Minor-Brachydactyly" was presented in the 'Journal of Genetics,' ii. pp. 21–40, figs. 15.

In 1913 a "Study of a Brachydactylous Family (Minor-Brachydactyly)" was presented in the Report of the 4th International Conference on Genetics, Paris (1911), pp. 549–562, figs. 14.

In 1914 a further paper on "Minor Brachydactyly, No. 2" appeared in the 'Journal of Genetics,' iii. pp. 217–220, pls. 3. In 1915 "A Second Brachydactylous Family" was published in the same journal, iv. pp. 323–340, pls. 5, figs. 3. In 1916 a paper on "Hereditary Abnormal Segmentation of the Index and Middle Fingers" appeared in the 'Journal of Anatomy and Physiology,' pp. 177–186, figs. 14. Drinkwater's accurate work in recording these rare cases of digital abnormality, and his demonstration of their Mendelian inheritance as simple dominants through a number of generations, culminated in his remarkable paper of 1917 on "Phalangeal Anarthrosis (Synostosis Ankylosis) transmitted through Fourteen Generations," which was published in the 'Proceedings of the Royal Society of Medicine,' x. pp. 60–68, figs. 4. Drinkwater was able to trace the inheritance of this peculiar anatomical abnormality present in a living individual through fourteen generations of direct descent in the male line back to the first Earl of Shrewsbury, who was killed in battle near Bordeaux in 1453. In this case the traditional evidence was confirmed by the identification of the skeleton in the tomb at Whitchurch.

Other important papers published by Drinkwater may be mentioned. In 1914 "Obligatory Bi-manual Synergia with Allocheiria in a Boy otherwise normal" appeared in the Report of the 17th International Congress of Medicine, London (1913), pp. 117–124.

In 1916 a paper on the "Inheritance of Artistic and Musical Ability" was published in the 'Journal of Genetics,' v. pp. 229–241.

In 1916 an account of "The Modern Descendants of Dr. Peter Chamberlen" was given in the Liverpool Med.-Chir. Journal, pp. 98–105.

In 1917 an article on "The Inheritance of Normal and Pathological Traits in Man," containing a valuable list of references,

appeared in 'The Practitioner' (March), pp. 24. The above list of papers published by Drinkwater will serve to record the valuable work accomplished by him, and they will remain as a permanent memorial to his name.

In addition to his work on Inheritance in Man, he was devoted to Botany and was very skilful in painting flowers in body-colour.

He died on the 11th July, 1925, after a severe attack of influenza. [C. C. Hurst.]

James Sykes Gamble, son of Dr. Harpur Gamble, R.N., was born in London on 2nd July, 1847. From the Royal Naval School, New Cross, Gamble went, with demyship, to Magdalen College, and graduated B.A. Oxford, with a first-class in the Mathematical School, in 1869. From Oxford he entered the École Nationale des Eaux et Forêts, Nancy, to undergo the instruction prescribed for probationers of the Indian Forest Service. His studies were interrupted owing to the Franco-Prussian War, this period being spent with other Indian Forestry probationers at the University of St. Andrews under the supervision of the late Dr. Cleghorn. When peace was restored Gamble returned to Nancy, where he completed his course with distinction before leaving for India. He reached Calcutta in 1871, and spent the first days of his Eastern service as the guest of Dr. (afterwards Sir George) King, Superintendent of the Royal Botanic Garden, for whom he had brought out from Kew a consignment of living plants.

After a distinguished professional career as an Assistant-Conservator of Forests in Burma (1871–72), in Bengal (1872–77), and at headquarters as personal assistant to the Inspector-General (1877–79), he was promoted to the grade of Conservator, and served in this capacity in Bengal (1879–82), in Madras (1882–90), and in the United Provinces (1890–99), where he also occupied the important post of Director of the Imperial Forest School at Dehra Dun. This is not the place to speak of what Gamble during his twenty-eight years of active service was able to do in promoting the interests and increasing the efficiency of forestry operations in India. His command of the confidence of his colleagues and of the Governments he served may best be estimated from the facts that during 1891–99 he was honorary editor of the 'Indian Forester,' and that at the close of his Indian service he was appointed C.I.E.

The scientific training imparted to the forestry cadets at Nancy was of the same high quality as the technological instruction that accompanied it. The botanical teaching in particular was equally thorough in the physiological, morphological, and systematic branches. Sound physiological knowledge Gamble regarded as part of the necessary equipment of the sylviculturist; his professional career was devoted to the application of physiological principles to forestry operations. Fortunately for Indian forestry, he had been especially influenced by the morphological teaching of the eminent Mathieu, and during the earlier portion of his

Indian service he was able to accomplish what had never so far been attempted, and to do this so thoroughly that his work has already become a classic. He had also learned at Nancy that systematic study, however irksome it may be, is of the greatest importance to economic work. He had already acquired an interest in such study before he reached India, and that interest, which was a dominant one during the whole of his active service, remained unimpaired after he retired.

While an Assistant-Conservator in Bengal, Gamble drew up a 'List of Trees, Shrubs, and Climbers of the Darjeeling District,' published in 1877, the year of his election to the Linnean Society on the 6th December. This List was found so useful that a second edition was called for in 1895.

More important still, both on account of the labour involved and because it was of consequence to every forest officer in India, was Gamble's great 'Manual of Indian Timbers,' prepared while he served at headquarters at Simla and first published in 1881. This work is a lasting tribute to the thoroughness with which he had mastered the morphological training he had received at Nancy and to his own industry, care, and skill. In this case, too, an urgent demand for a second edition was manifested: this was prepared and issued in 1902.

Meanwhile, in connection with his field-studies Gamble had undertaken the difficult task of collecting material for a monograph of 'The Bambuseæ of British India.' This work, which appeared in 1895, soon became recognized as a standard treatise, and led to Gamble's election to the Royal Society in 1899.

When Gamble retired he laid aside the Indian duties, to which he had meant to devote himself, in order to collaborate with his friend, Sir George King, on the 'Materials for a Flora of the Malayan Peninsula,' on which King had been engaged since 1887. For the next ten years they worked in conjunction, and when in 1909 Sir George died, Gamble continued the task single-handed until 1915, when he was asked to undertake the preparation of a 'Flora of the Presidency of Madras.' He had completed the seventh instalment of this work and had reached the end of the Euphorbiaceæ when, to the regret of his friends and of all who appreciate useful work thoroughly and unostentatiously done, he died after a short illness on 16th October, 1925. [D. P.]

Dr. John Robertson Henderson, C.I.E., who died at Edinburgh on 26th October, 1925, was born at Melrose on 21st May, 1863, was educated at Dulwich College and Dollar Academy, and studied medicine in the University of Edinburgh, where he came under the influence of Sir Wyville Thomson, the Director of the 'Challenger' Expedition. He graduated M.B., C.M., but his interest had already turned to marine zoology, and he became one of the band of young zoologists and oceanographers working under John Murray in the 'Challenger' office in Edinburgh, at the marine laboratory at Granton, and on Murray's yacht

'Medusa' on the west of Scotland. About this time Henderson published several papers on Decapod Crustacea from Scottish waters, and finally his well-known report on the Anomura of the 'Challenger' Expedition (1888).

In 1886, Henderson was appointed Professor of Zoology in the Christian College, Madras, a post which he held for 25 years. Before retiring from the Chair, however, he was appointed (in 1909) Superintendent of the Madras Museum and Connemara Public Library and Keeper of the Marine Aquarium in succession to Mr. Edgar Thurston. On retiring under the age limit in 1919, he retired to Edinburgh and took an active part in the scientific life of the city, serving on the councils of the Royal Physical Society and of the Scottish Zoological Society.

While in India Dr. Henderson had the reputation of being one of the best teachers in the Madras University, and attracted a number of the abler students. He specially encouraged field-work among his pupils, and did much to stimulate interest in natural history by his work in the museum and the aquarium.

After going to India, Dr. Henderson continued his studies on Crustacea, and published in our 'Transactions' in 1893 a memoir entitled "A Contribution to Indian Carcinology." This is not only a piece of sound and careful systematic work (much of it done while on leave, in the Zoological Department of the British Museum), but is especially valuable for the account of the habits and habitats of the marine Crustacea in the neighbourhood of Madras, which could only have been written by a keen and observant field-naturalist. Among his later papers may be mentioned an account of the Hermit-crabs (Paguridæ) of the 'Investigator' (Rec. Ind. Mus.) and a paper on River-prawns of the genus *Palæmon* from South India, published in collaboration with his pupil, Dr. G. Matthai, now Professor of Zoology in the Government College, Lahore. His last publication on Crustacea was a description of a new species of the curious little Coral-gall Crab *Cryptochirus* (Ann. & Mag. Nat. Hist., Ser. 7, vol. xviii. 1906).

Dr. Henderson was a man of wide interests. He was particularly interested in, and had a wide knowledge of, the folk-lore, religions, and antiquities of the races of South India; he had a considerable collection of Indian brass-work and ceramics; he was an authority on some branches of India numismatics and published a catalogue of the coins of Tipu Sultan. He was (as the present writer can testify from a slight acquaintance) a man of great personal charm and had a wide circle of friends in India and in this country.

For information used in preparing this notice I have to thank Dr. James Ritchie of Edinburgh and Professor George Matthai of Lahore. [W. T. C.]

The Rev. Prof. George Henslow passed away at Bournemouth on the 30th December last in his 91st year. He was the younger son of the Rev. John Stevens Henslow, Professor of Botany in the

University of Cambridge and afterwards Rector of Hitcham, in Suffolk; his mother was Harriet, a sister of the Rev. Leonard Jenyns, better known as Blomefield, a West Country naturalist. The subject of our notice was born at Cambridge on 23rd March, 1835, received his education at Sawston Parsonage, six miles to the south of Cambridge, then at the Grammar School of Bury St. Edmunds, and in 1854 became a scholar of Christ's College, Cambridge. He gained a First Class in the Natural Science Tripos, and Second Class in Divinity and Mathematics. After graduating in 1858, he was ordained and became curate of Steyning, Sussex, in 1861 receiving the appointment of headmaster of Hampton Lucy Grammar School, and four years later to a similar post in London. In 1886 he became lecturer on botany to St. Bartholomew's Medical School until 1890, lecturing at other institutions also. He was a popular lecturer at the Royal Horticultural Society for many years; he had a good resonant voice, his method was attractive, his delivery clear and plain, and in the days before lantern-slides were common, at the right moment he would display a specimen or a drawing to his audience.

His pen was busy upon botanical subjects, largely in a popular sense, on Evolution, the fertilization of plants, Bible plants, the origin of flowers, and the like. Some years before his death he gave to the Linnean Society eleven volumes of reprinted papers and three volumes on Darwinian subjects. He was elected a Fellow of the Society on the 17th March, 1864, and at the time of his death was the senior Fellow but two. He was twice married, his second wife surviving. [B. D. J.]

To the majority of Fellows of the Society the name of William Philip Hiern is practically unknown, but to those whose memory can go back to the 'seventies in the last century, he will be remembered as a frequent attendant. He was born at Stafford on 19th January, 1839, the son of J. G. Hiern and Ann, daughter of James Webb, and, after school at Worcester from 1848, in 1857 he entered St. John's College, Cambridge; in 1861 he was ninth wrangler, and from 1865 to 1868 he was a Fellow of his College; he also graduated M.A. from Christ Church, Oxford. His earliest articles in print were mathematical, and not until 1865 did he publish any botanical memoir. Three years later he married Martha Bamford, a Yorkshire lady, and moved to Richmond in Surrey, for convenient access to Kew, where he worked for nearly nine years, contributing to the second and third volumes of Oliver's 'Flora of Tropical Africa,' in the latter volume joining forces with Prof. Daniel Oliver in working up the Compositæ. At the same time he elaborated his 'Monograph of the Ebenaceæ,' published in the twelfth volume of the 'Transactions of the Cambridge Philosophical Society'—nearly 300 quarto pages. In our own issues we have a paper on Rubiaceæ, Journal, Bot. xvi. (1878), and on Liberian Coffee in the 'Transactions,' ser. II. i. (1880). In conjunction with Count de Ficalho in our

'Transactions,' II. ii. (1881), he gave an account of a collection of Central African plants collected by Major Serpa Pinto.

In 1877 he had removed from Richmond to the Castle, Barnstaple, where he spent the remainder of his life, except a few brief intervals in London and elsewhere. He began to separate the study set of Welwitsch's Angola Plants for the King of Portugal, and selected the next best set, with full copies of the copious notes by the collector, for the British Museum; he also started upon a catalogue of the plants, when his call to the family estate in Devonshire caused his removal from Richmond, and completed it after a lapse of fifteen years, when he rented a house in Kensington so as to be near to the Museum. The four parts of this catalogue amounted to more than 1000 pages, issued from 1896–1900. In the last-mentioned year he gave evidence before the Departmental Committee of the Treasury upon the question of uniting the botanical collections of the British Museum and Kew, which he advocated. Hiern adopted Otto Kuntze's rigid adherence to priority in nomenclature, and condemned the 'Nomina conservanda' as a weak yielding to popular prejudice. After this he wrote Scrophulariaceæ for the 'Flora capensis' (1904), which seems to have been his last important work. Subsequently he seems to have confined his botanising to the local flora, and yearly issued lists of newly-found plants in the reports of the Devonshire Association. In 1914 he went to the British Association meetings in Australia though 75 years of age at the time.

He held many local positions: Lord of the Manor of Stoke Rivers, Governor of Barnstaple Grammar School, President of the Devonshire Association (1919), and Chairman of the Devon Education Committee. He died at his house on the 29th November, 1925, his wife and only son having predeceased him. His election to our Society took place on 20th February, 1873, serving on the Council 1874–76, and to the Royal Society in 1903. A paralytic stroke in 1923 partially disabled him, but he regained much of his former vigour. Reserved in demeanour, he was felt to be a man who had a high standard of conduct, and was steadfast in the course he considered to be right. [B. D. J.]

By the death of Joseph Henry Maiden at Turramurra, near Sydney, on the 15th November, 1925, Australia lost one of her most distinguished scientific men. He was born at St. John's Wood, London, on the 25th April, 1859, and was educated at the City of London Middle Class School, from which he went to the University of London.

He was awarded the Fishmongers' Scholarship tenable at the University of Cambridge for three years and valued at £50 a year; but he did not avail himself of this, as he decided to remain in London in order to pursue his studies at the Science Department of the University of London. His early training in the subjects of chemistry and botany were later to be put to good advantage in his future career.

Maiden was never a robust man, and ill-health caused him in 1880 to try a sea voyage to Australia, and the genial climate and the interest of the country made such strong appeals to him that the return ticket with which he had provided himself was never availed of. He brought to Australia letters of introduction to a bishop (never presented, for his diocese was far from Sydney) and one from Prof. Banff—to whom Mr. Maiden had been Demonstrator for nearly three years in London—to Professor Liversidge, which he did not present till a year after date. The Professor was inclined to find fault at so belated a visit, until the circumstances of the holiday were explained to him; he added that Prof. Banff had written to him twice about his visitor. He ended up by offering the post of Curator of the Technological Museum it was contemplated to establish in Sydney, based on specimens suitable and unsuitable, left behind from the Sydney International Exhibition of 1879–80. The offer was accepted, and Maiden's services as Curator began on 3rd October, 1881.

The Museum with other institutions was housed in the Exhibition building, and the whole was destroyed by fire on 22nd September, 1882.

In the Outer Domain at the back of the Sydney Hospital was a long galvanized building, unlined and floored with battens, for it had been the horticultural building of the International Exhibition. The homeless Curator begged part of the shed, and the use of it was granted to him before the end of the year. The Museum remained housed here for ten years, during which period its collections were largely augmented. In 1893 it was moved to its present site at Ultimo. A year later he was appointed in addition to his present post of Curator of the Museum as Superintendent of Technical Education.

The early years of his Curatorship were spent with characteristic energy in organizing the new institution, and left him little leisure for original research. So far as I can find, his first papers published in Australia were several, constituting a series on "Some New South Wales Tan-Substances," the first of which was read before the Royal Society of New South Wales on the 1st June, 1887, and published in vol. xxi. of the 'Journal and Proceedings' of the Society. From this time onwards many papers were contributed by him to the 'Proceedings' of various Australian Scientific Societies; some were published in the 'Pharmaceutical Journal' (Eng.). The articles dealt mainly with tanning materials, gums, resins, kinos, etc., his early training in chemistry at the London University fitting him eminently for this work.

Maiden was a great compiler of information, and made a point of filing in a convenient form of reference, not only notes from technical journals, but also newspaper cuttings and extracts from the letters of his numerous correspondents. He was most methodical in his work, and everything he wanted to use in his writings or official work was always ready to hand.

It was this methodical system of work that enabled him to

publish in 1887 'The Useful Native Plants of Australia,' a volume of nearly seven hundred pages. The book unfortunately never ran through more than one edition, in spite of the fact that there was a keen demand for it, and it soon became scarce. Even now, although much of the information requires to be brought up to date, the work is much sought after.

'Wattles and Wattle-Barks' first appeared in 1890 and went through three editions, the last of which appeared in 1906 and ran to a little over a hundred pages.

'A Bibliography of Australian Economic Botany,' Part 1, was published in 1892.

In 1893, Maiden was appointed, in addition to his current position, Consulting Botanist to the Department of Agriculture, Sydney, in succession to Mr. Fred Turner, and immediately started to contribute articles freely to the 'Agricultural Gazette of New South Wales,' of which he remained a prolific contributor almost to the time of his retirement from official life in 1924.

In 1896, Maiden was appointed Director of the Sydney Botanic Gardens and Government Botanist of New South Wales in succession to Mr. Chas. Moore, who had held the dual position since 1848. The new Director was imbued with the one idea to make the Botanic Gardens at Sydney a centre for research on the flora of Australia and the Pacific, in somewhat the same way as Mueller in his lifetime had made the Botanic Gardens and National Herbarium at Melbourne. The early days at the Botanic Gardens were full of difficulties, but Maiden was a man of exceptional energy, and early mornings and late evenings saw him working on behalf of the institution in the success of which his whole life was wrapped up.

In spite of multitudinous official duties, time was found to carry out extensive researches on the taxonomy of Australian plants. Maiden's life was a proof of the ability, so often demonstrated, of the research worker to organize and control an important institution, and should be a direct challenge to the modern tendency to put so-called "organizers" in charge of important scientific institutions, and to regard the man with a strong leaning towards original research as somewhat of a "crank." Maiden wisely determined to specialize in certain groups of particular interest to students of the Australian flora, and soon made himself the recognized authority on the two large genera *Eucalyptus* and *Acacia*. *Opuntia*, from the fact of several species being such pests in Australia, was another genus that received attention at his hands.

In 1903 he commenced his *opus magnum*, 'A Critical Revision of the Genus *Eucalyptus*,' a work that ran to seven volumes and to which he was putting the finishing touches at the time of his death. It was his desire to see this work rounded off before he died, a hope we are sorry to record never realized.

This Revision has come in for some criticism in Australia, being rather difficult to follow, but we must remember that the work

was extended over a period of twenty-one years, the parts being issued as finances allowed. The consequence of this is that the same species appears in several places in the work, and often the author had to change his opinion regarding the limits of species, synonyms, distribution, etc., and changes of opinion are quite impossible to avoid in studying a difficult genus like *Eucalyptus* over a long period of time.

'The Forest Fauna of New South Wales' was started about the same time as the 'Critical Revision.' It was never finished, but ran to eight volumes; the last volume published consisted of seven instead of the customary ten parts. This work was one of the most useful published by Maiden, and it is a great pity that it could not have been continued to an end. On receipt of the last part, I wrote to the author offering some criticism on and expressing regret at the somewhat abrupt termination of the work, and received the following letter in reply, dated from Turramurra, 24/10/1924:—

"I have no doubt that your criticisms on the last part of the 'Forest Flora' are quite justified, but to tell you the truth I have lost interest in it.

"A couple of years ago, during a panic of printing retrenchment, I was ordered to stop the 'Forest Flora.' I made no protest, but others did, and I finally consented to do up to part 77, *and no more*. Closing the thing up under the circumstances (and they took years to do even this) caused much confusion. My health was broken, and I saw only one proof, and what happened I don't know. I never got any thanks or pay for it.

"As regards the 'Critical Revision,' I took up a different stand. I insisted on its going on. The manuscript up to the 70th part is in my room as I write, but the Government Printer (who also has retrenchment) is giving me only about two parts a year, and some of it may be published after my death. It is very difficult to make a connected work when you don't know when the next part will be printed."

The history of the 'Critical Revision' is unfortunately the history of several other works of Maiden, such as 'The Flowering Plants and Ferns of New South Wales' (in conjunction with Mr. W. S. Campbell), and the 'Illustrations of New South Wales Plants' (not previously depicted). Each part of the former consisted of four beautifully-executed coloured plates and accompanying descriptive matter, and if it could have been brought to a successful end, the flora of New South Wales would have been more elaborately illustrated than that of almost any country. The cause of botany would probably have been served better had Maiden been content to bring out his publications on a less elaborate scale.

Maiden was a most prolific writer, and contributed papers freely to the 'Proceedings of the Linnean Society of New South Wales' and the 'Proceedings' of the Royal Societies of each of the Australian States. Very few papers were sent outside of

Australia for publication. It is difficult to single out for special reference any one paper or series of papers from these multitudinous contributions; but the series that always appeals to me as the best, both from a botanical and scholastic point, is the series written in conjunction with the late Mr. E. Betche, published under the title of "Notes from the Botanic Gardens, Sydney," which consists of eighteen papers in the 'Proceedings of the Linnean Society of New South Wales' from 1897–1913.

Two works of agricultural interest issued during his term of office at the Botanic Gardens were 'A Manual of the Grasses of New South Wales' (1898) and 'The Weeds of New South Wales' (1920), of which unfortunately only the first part was issued. In the former work the method of quoting references is extremely unfortunate; for instance, under the heading "Where Figured" we get such bare references as the following: Buchanan, Duthie, Agricultural Gazette. The last is very frequently quoted, but to find the illustration referred to, one has to hunt through all the early volumes of the 'Agricultural Gazette of New South Wales,' whereas it would have been a very simple matter for the author to have quoted the volume and plate. One cannot help thinking that this was done with the express purpose of ignoring the work of Mr. Fred Turner, who held the position of Consulting Botanist to the N.S. Wales Department of Agriculture before Mr. Maiden's appointment in 1893. It was very unfortunate that Maiden was unable to suppress his personal feelings more in his writings, which now and again contain rather slighting references to other Australian workers.

'A Census of New South Wales Plants,' written in collaboration with E. Betche, appeared in 1916, three years after Mr. Betche's death. It follows the system of Engler and Prantl, and although mostly only a list, is a very essential work for all workers on the Australian flora.

Maiden travelled extensively in New South Wales, and to a lesser extent in the other Australian States. Outside his own State his most extensive botanising expedition was one to Western Australia from October 1909 to January 1910. This trip cost over £400, all of which, with the exception of a Government grant of £75, he defrayed out of his own pocket.

In June 1900 he took advantage of the long service leave conditions of the New South Wales Government Service to revisit Europe. He attended the International Botanic Congress held in connection with the Paris Exhibition in October, and the Botanical Section of the British Association for the Advancement of Science in September. In the United Kingdom and Ireland, France, Germany, Holland, Belgium, and Ceylon he visited many of the principal botanic gardens, parks, and herbaria.

For many years Maiden was honorary buyer and tester of Australian forest-tree seeds for the South African Government, and his work for forestry in South Africa was very strongly appreciated by the Union Government. It was a great disappointment to him, when an offer to visit South Africa was

received, the Premier of the time stated he could not see his way clear to grant him leave to make the journey.

In addition to his researches in the field of sytematic botany, Maiden found himself able to devote a large amount of his time to biographical work. In this field his best known work is 'Sir Joseph Banks: The Father of Australia,' Sydney, 1909, written for the purpose of raising funds to erect a memorial to Banks. 'The Sydney Botanical Gardens: Biographical Notes,' concerning the officers in charge, was issued in the form of leaflets by Messrs. Leigh & Co. of Sydney, 1902-3. Biographical notes on Australian botanists were published in the 'Proceedings' of different scientific periodicals.

In addition to his multifarious official duties and systematic research, Maiden found time to devote himself to the service of his fellow scientists in Australia, and for many years was an active member of the Councils of the Royal and Linnean Societies of New South Wales. Of the former he was one of the joint Honorary Secretaries for twenty-two years, and during his last year of office (1919) wrote 'A Contribution to a History of the Royal Society of New South Wales (with information in regard to other New South Wales Societies)': this historical account occupied 147 pages of vol. lii. of the Society's 'Proceedings.' He was twice President of the Society—1896 and 1911. He was President of the Linnean Society of New South Wales during 1901 and 1902. In 1909 he took over from Prof. A. Liversidge the position of Permanent Honorary Secretary of the Australian Association for the Advancement of Science, a position he held until 1922. On his retirement he was offered the Presidency of the next meeting (Wellington, N.Z., 1923), but owing to ill-health had to decline. He was President of the Biological Section of the eleventh meeting of the Association, Adelaide, South Australia, 1907.

He was one of the prime movers in the Wattle Day movement, as at present constituted, in Australia, and continued to take an active part in the work of the New South Wales Wattle Day League practically to the end of his very busy life. From 1904 to 1917 he was President of the Horticultural Society of New South Wales, and for eighteen years was President and afterwards Patron of the Horticultural Association of New South Wales. For several years he was a Councillor, and for two years President of the Australian Historical Society.

Maiden was elected corresponding or honorary member of many scientific and allied societies, both in Australia and abroad. In 1915 he was awarded the Linnean Medal by the Linnean Society of London, this being the first occasion on which the medal had been awarded in Australia. In the same year he was elected a Fellow of the Royal Society. In 1922 he was awarded the Mueller Memorial Medal of the Australian Association for the Advancement of Science, and in 1924 the Clarke Memorial Medal of the Royal Society of New South Wales. In the latter year he retired from official life and went to live at Turramurra, a suburb of

Sydney. He was a man who could not be idle, and a month or two after his retirement he wrote me, 11/7/24: "You will be amused when I tell you I have been busier than ever since I left the Botanic Gardens, and I am doing my best to reply to the many kind friends who have been so kind as to say they are sorry I am going."

Social pleasures were not ignored, and in an interview printed in the *Sydney Morning Herald* of the 24th November, 1925, Prof. Sir Edgeworth David stated: "How often has Maiden's keen sense of humour, added to his wealth of information and experience, charmed his listeners at the many delightful gatherings at his old home at the Botanic Gardens." He was a prominent churchman and for many years was a warden of St. Andrew's Cathedral, Sydney. According to an address by Dean Talbot, he rendered "valuable though unobtrusive service to the church."

He leaves a widow and four daughters, two of whom are married, one to Dr. Brown Craig of Sydney, the other to Dr. Hamish Paton of Orange. The loss of his only son Hammond Maiden in the ship 'Eulomene,' which foundered on the Dogger Bank, North Sea, 16th February, 1905, whilst on a passage from Bremerhaven to the Tyne, when all hands were lost, was a blow from which he never fully recovered. [C. T. White.]

Prof. Jean Massart, Foreign Member of this Society (1921), was born near Brussels in 1865 and died in 1925. Trained under Errera at Brussels, he succeeded his teacher in the professorship in 1905. His earlier work related especially to cell physiology and the irritability of plants. Later, he found his real métier in plant ecology and geographical botany, in which field perhaps his most important contribution is the fine volume entitled 'Essai de géographie botanique des districts littoraux et alluviaux de la Belgique' (1907). This and his other works in the same field are illustrated by numerous photographs which reach a very high level of excellence, alike on technical and artistic grounds. Indeed, not a few of his landscapes recall the work of the old Flemish masters. The following year 86 large plates, admirably reproduced, were published in an album under the title 'Les Aspects de la Végétation en Belgique'—a worthy monument to Massart's skill. He made a good professor, and did much to stimulate an interest in the native vegetation outside academic circles (see especially his beautifully illustrated 'Pour la Protection de la Nature en Belgique'). To students he was particularly helpful, meeting them on an equal footing in the cafés, etc., thus breaking through the conventions of an older generation. Massart's was a very bright intelligence, and even his smaller papers always contain ideas that will bear fruit.

With the outbreak of the War and the occupation of Belgian territory, Massart became involved in all sorts of turmoil, propaganda, and the like. He was concerned with the 'Presse Clandestine,' and wrote several books dealing with the national

wrongs. Indeed, the energy with which he espoused his country's cause made it necessary for him to disappear. However, he found a haven of refuge at Antibes, where he turned once more to plant ecology, and studied the climatic adaptations of the Mediterranean flora as compared with similar phenomena in Belgium (1917). On his return to Belgium, Massart published very interesting notes on changes observed in the vegetation arising from the year-long flooding of the low ground in the Yser system and its redraining at the close of hostilities. His text-book, entitled 'Éléments de Biologie générale et de Botanique,' dates from 1921, and gives some idea of his wide outlook.

Massart was well known to botanists in this country from having accompanied the first I. P. E. throughout the British Isles in 1911. On this occasion, as usual, his studies were supplemented by the constant use of the camera; and the many hundreds of photographs which he took (though never published) form an admirable pictorial summary of our vegetation. A very able, sympathetic, and kind-hearted man, Massart made friends everywhere, and his characteristic, burly figure, clad in black alpaca that hot summer, will long remain in the memory of his companions on that excursion. [F. W. O.]

Frank Morey was born on the 4th March, 1858, at Newport, Isle of Wight, where he resided almost throughout his life. From quite early years he was attracted to the study of natural history, and he acquired an extensive knowledge of both animals and plants. Though never professing to be an expert biologist, his acquaintance with the various groups of insects and mollusca was by no means superficial. He was a careful and discriminating collector, and accumulated a very considerable number of specimens, especially of the groups mentioned. In 1892–3 he paid a visit to the East, and, in the course of travels in India, Ceylon, Egypt, and Palestine, added much to his knowledge of natural history, and of archæology, in which latter science he was also keenly interested. It was however in connection with his native island that his most important work was done, and probably no one has possessed such a wide and intimate knowledge of its fauna and flora.

In 1909, with the assistance of a number of specialists, he published 'A Guide to the Natural History of the Isle of Wight,' a large octavo of nearly 600 pages, and by far the most comprehensive account of the natural objects of any extensive area in this country. The species of plants and animals enumerated totalled 6982, and in many cases useful notes are included with the records. In 1919 he founded the Isle of Wight Natural History Society, of which to the day of his death he was not only the Honorary Secretary and Editor, but the guiding spirit and prime mover in all its activities.

He was a genial kindly man and was much respected throughout the island. Though of modest and retiring nature, he was

intensely public-spirited, and was always ready to lend a hand in any useful work. For many years he was Honorary Curator to the Archæological Museum at Carisbrooke Castle, the admirable arrangement and condition of which is due to the unremitting care of himself and his sister, Miss Catherine Morey, who greatly assisted him in all his pursuits. The equipment and arrangement of the Geological Museum at Sandown, in which the palæontology of the island is so well represented, was almost entirely his work. He never spared himself trouble or expense where any public undertaking was concerned. He purchased Borthwood, a fine piece of undulating woodland of some 55 acres, the last remaining part of old Sandown Forest, to be kept as a nature reserve, and just before his death transferred it to the National Trust.

For many years he was a partner in a firm of timber merchants, founded by his father, and when it was turned into a Company, became its Chairman.

He was elected a Fellow of the Linnean Society on the 15th February, 1906.

He died on the 29th December, 1925, in his sixty-eighth year, after a very long illness, from a long-standing intestinal trouble, and by his express direction his remains were cremated. [J. G.]

James Murie, who died at Leigh-on-Sea on the 25th December, 1925, was born at Glasgow on the 30th March, 1832, and received his education in that city, passing into the University, and after five years' study in the medical faculty, graduated M.D. in 1857, upon which he was appointed Pathologist to the Glasgow Royal Infirmary. In 1858 he obtained the post of Assistant in the Museum of the Royal College of Surgeons, England, under Prof. J. T. Quekett. After two years of this work, he visited several European countries, France, Holland, Germany, Spain, and Sweden, and then made several voyages as surgeon on a trans-atlantic liner. He accepted the position of medical officer and naturalist to Consul John Petherick's expedition towards the sources of the White Nile and to meet the explorers Speke and Grant on their return, ultimately arriving at Gondokoro four days after their reaching that place. Of the collections made by Dr. Murie the plants were sent to Kew, where they were registered as received from Petherick, and the animals to the British Museum, the collection of Nile fishes being stated by Dr. Günther to be the best series ever obtained in this country from that river.

On Murie's return to England, he was again engaged by the Royal College of Surgeons to arrange the vast collection of microscope slides of the late Prof. J. T. Quekett, which, with a catalogue he drew up, occupied more than a year.

On completing this, in 1865 Dr. Murie competed for and obtained the newly-established office of Prosector to the Zoological Society, holding that position for five years, and examined and in many instances made complete dissections of four thousand

animals. During this period and for a number of years afterwards he contributed papers to the number of 70 or more to various scientific journals, mainly to the 'Proceedings' and 'Transactions' of the Zoological Society and to our own Journal and Transactions.

Being a man of great energy and wide interests, he was enabled with the material at his disposal to add vastly to our knowledge of the coarse anatomy of many of the higher Vertebrates. His researches were not however confined to any one group, including such diverse subjects as Sponges, the growth of Fishes, Bats, and their parasites, the structure of Birds and of Mammals; but it was, perhaps, the anatomy of the Mammalia that he made particularly his own, and he probably will be remembered most for his classical work on the Anatomy of the Aquatic Mammals, embodied in a notable series of memoirs in the 'Transactions' of this and of the Zoological Societies. He was offered the position of surgeon-in-chief to the expedition under Sir Samuel Baker, but he declined it as he was now immersed in investigations which he preferred. In his arduous duties as Prosector and author his health suffered, and he resigned his Prosectorship in 1870. Later he filled for a time the duty of assistant physician at Bethnal House Asylum, and was elected Lecturer on Comparative Anatomy and Zoology to the Medical School of the Middlesex Hospital.

In the autumn of 1875 the question of appointing a paid Secretary was raised in our Council, and upon the report of a special committee the Council decided that Dr. Murie be appointed, his duties being to assist the Secretaries, help in editing the journals and other publications, to provide material for the evening meetings to make them "instructive and attractive," and to collect memoranda for obituary notices. He was appointed "Sub-editor of the Society's Publications" as from the 1st January, 1876. In this new office Dr. Murie threw himself with energy, relieving the Librarian of much drudgery, until in 1880, Mr. Richard Kippist, who had served the Linnean Society in various capacities since 1830, retired on pension, when Dr. Murie was appointed by the Council as his successor. A few years later he rented a small cottage at Leigh-on-Sea, near Southend, and spent many week-end holidays there. In 1888, owing to certain differences of opinion that arose between him and the President, Murie vacated his post and retired to Leigh with a pension granted to him by the Society for the services he had rendered during the previous twelve years.

After an intensely active life, he subsided into one of extreme tranquillity. He once boasted to one of us that, if he had a small pension, he would produce a paper for publication every three months, but from the time of his retirement only one portion of a report on Thames Fisheries has been published; of the second part only a few pages have been printed, and several sections of the MS. are missing. During his later years Murie lived the life of a complete recluse alone in his cottage at Leigh. His friends tried to induce him to remove to more comfortable

quarters, but his strong self-will rejected their kind suggestion until December last, when a paralytic stroke made it imperative to remove him to Rochford Workhouse Infirmary, where he lingered for a few days and then passed away. He was buried in a grave he had bought some years earlier.

He was elected F.L.S. on the 20th February, 1868, and was a Fellow also of the Zoological and Royal Microscopical Societies; he received the Hon. LL.D. of St. Andrews in 1877.

[B. D. J. & R. H. B.]

The last New Year's Honours List contained a knighthood bestowed upon Henry Alfred Alford Nicholls, who died on the 9th February, 1926, a few weeks after the announcement.

He was born in London on the 27th September, 1851, the son of Thomas William Nicholls. He received his technical education at Aberdeen University and St. Bartholomew's Hospital, London, taking M.B. (Honours) and C.M. at the University in 1873 and M.D. in 1875. In the latter year he emigrated to Dominica, when the greatest depression reigned, as Assistant Medical Officer to Dr. Imray, whom in due course he succeeded. The cultivation of the lime, *Citrus medica* var. *acida*, had been started, but Dr. Nicholls took it energetically in hand: his estate, St. Aromont, was an example of good cultivation, and in time the culture grew until Dominica not only prospered, but even became the chief centre for the product, supplanting Montserrat in this respect. The historian James Anthony Froude visited the island in 1887, and gave an account of the cultivation in his 'English in the West Indies': the limes went principally to New York, but the manufactured citric acid came to Europe. Dr. Nicholls also engineered roads through the island, and he was a leader of the expedition which discovered the 'Boiling Lake,' a lake of lava always seething in the cauldron and sometimes bursting forth, but always acting as a safety-valve for the volcanic forces. In 1891–92 he contributed 346 West Indian plants to the Herbarium of the Royal Botanic Gardens, Kew.

Since the War, when the planters were absent and engaged in hostilities, the limes became subject to the disease known as "Withertip," causing havoc in the plantations.

After a residence of half a century in the island, he retired from active duty as Chief Medical Officer in Dominica on the 31st July, 1925; besides having served in several other functions such as Commissioner for that island at the Colonies and India Exhibition in London in 1866, and again at the Tropical Products Exhibition in 1914. As a practical agriculturist he was author of 'An Elementary Text-Book of Tropical Agriculture,' Jamaica, 1891, re-issued the next year in London as 'A Text-Book, etc.' He also wrote shorter articles on the cultivation of Liberian coffee and the banana.

To the end of his life he lived at Kingsland House, Roseau, the capital and only town in Dominica. In 1877, soon after his arrival, he married Marion, third daughter of J. Corney Crompton,

J.P.: four sons and six daughters crowned this marriage. He was elected F.L.S. on the 7th May, 1908; the usual title he bore in the West Indies was "The Uncrowned King of Dominica." [B. D. J.]

Sir WILLIAM SCHLICH, son of Kirchenrath Schlich, of Hesse-Darmstadt, was born in 1840. From school at Darmstadt he entered the University of Giessen, and afterwards became a practical forester. While thus employed he was, in 1866, appointed to the Indian Forest Department, and sent as an assistant-conservator to Burma. In 1867 his university conferred on him the degree of Ph.D., and in 1870 he was promoted to the grade of conservator of forests and transferred to Sind. Towards the end of the year 1872, Schlich was posted as conservator to Bengal, and held this position until 1881, when he became Inspector-General of Forests to the Government of India. In 1885 he left India to organize the School of Forestry founded at Cooper's Hill, and remained head of that school till its transfer to the University of Oxford in 1905, when Schlich was appointed Professor of Forestry there, and occupied the Chair until he retired in 1919. He had soon after reaching Cooper's Hill, obtained naturalization as a British subject.

A great forest officer, Schlich is still remembered in India for his satisfactory organization and admirable management of the forests of northern Bengal, and will be equally remembered in this country for his exhaustive 'Manual of Forestry,' which has long been and will probably long continue to be the "guide, philosopher, and friend" of forest officers in every colony and dependency of the Empire. Though he did not himself contribute to botanical literature, his practical sympathy with botanical workers was conspicuous. It was to his influence that the publication, as apart from the preparation, of the late Mr. Gamble's Darjeeling 'List' was due; it was to no little extent owing to him that Gamble's 'Manual of Indian Timbers' was published. He showed his sympathy with botany again when, on reaching this country in 1885, he became a Fellow of the Linnean Society on the 18th June. The appreciation of his own 'Manual of Forestry' was marked by his election to the Royal Society in 1901.

Schlich will long be remembered, and his memory will be esteemed for his work in the cause of forestry training. In 1873, soon after he assumed charge of the Bengal forests, he urged the establishment of forestry classes at the well-known Engineering College at Roorkee, to which the various provincial Governments in India already had the right to send young Indian forest subordinates for a year. Schlich found that the young men who had enjoyed this privilege returned to duty with a good deal of useful engineering knowledge, but that they had learned little or nothing about forestry. His representations were not given effect to, but his arguments could not be refuted, and eventually

the Forest Department had to found its own Forestry School at Dehra Dun. It is interesting to think that, in 1885, Schlich was invited to arrange at Cooper's Hill, for the benefit of young Englishmen, what he had recommended twelve years before at Roorkee for the benefit of young Indians. His services to this cause were recognized publicly when, in 1909, Schlich was created a K.C.I.E. He died at his residence, 29 Banbury Road, Oxford, on September 28, 1925. [D. P.]

Georg Schweinfurth was born at Riga on the 29th December, 1836, the youngest of nine children. His father, a successful and esteemed merchant, had fled from Baden, in Southern Germany, to the Baltic provinces in order to escape conscription during the Napoleonic Wars, and his mother's family had immigrated from Northern Germany, so that Schweinfurth was of quite German descent though born a subject of the Czar. He received his education in private schools and later on at the gymnasium of his native town. Already as a boy he showed a keen interest in botany and in reading books on travel and exploration. At the age of twenty he came for the first time to Germany, accompanying his parents to the castles of Gastein. On this occasion he ascended the Gross-Glockner; this was the eighth ascent of the mountain. The richness and beauty of the alpine flora definitely decided his career; he became a botanist of the good old style, and his "muse, not a frail peerer through ground lenses, sung fresh and free in the great temple of Nature."

He studied at the universities of Heidelberg, Munich, and Berlin, and was promoted Dr. phil. in 1862 on a paper dealing with a collection of Æthiopian plants. The study of this collection and others from adjacent regions had aroused in him a keen desire to see for himself the country where the specimens had come from. Encouraged by the famous explorer Heinrich Barth and advised by Kotschy and Fenzl, he started for Egypt at the end of 1863. In a small barque he travelled along the western shore of the Red Sea from Kosseir to Suakin, and visited the mountains near the coast. From Suakin he turned inland to Matamma, the chief place of Gallabat, north-west of the Abyssinian highlands, descended the Nile to Khartoum and Berber, and crossed the Nubian mountains to Suakin. From there he returned to Suez and Egypt, and in July 1866 landed at Trieste. The results of this first voyage were a very important botanical collection of about 2500 numbers, many geographical and ethnological discoveries, and the completion of the maps of the region traversed.

Well-trained and highly-reputed scientific traveller as he now was, Schweinfurth succeeded in gaining by recommendation of Alexander Braun and Ehrenberg, out of the funds of the "Humboldt Stiftung für Naturforschung und Reisen" and of the "Ritter-Stiftung" of the Berlin Geographical Society, the means for the botanical exploration of the Upper Nile Region. In

July 1868 he set out again for Egypt. From Khartoum he travelled in a barque to the limit of navigability on the Bahr el Ghazel, and then turned southwards, passed the watershed between the Nile and Congo basin, and discovered the Uelle, which he took for the beginning of the Chari. This discovery of a large stream and that of the pigmy tribe of the Accas placed him high among the African explorers, and the wonderful book he published on his journey, in English under the title 'The Heart of Africa,' made him known all over the world, and obtained for him the Founders' Medal of the Royal Geographical Society of London. From this journey, which lasted from 1868 to 1871, he brought home a botanical collection of more than 4500 numbers, each consisting of numerous excellently-prepared specimens. The special importance of this collection is that it was made on a voyage which led from desert-like regions nearly to the edge of the rain forest of the interior Congo basin. Many of the new species were first described in the earlier volumes of Oliver's 'Flora of Tropical Africa.'

In 1874, Schweinfurth was again in Egypt, and resided at Cairo for thirteen years. From here he made many trips to the oases of the eastern Sahara and the desert between the Nile Valley and the Red Sea, making botanical, geological, and archæological collections and drawing many maps of hitherto nearly unknown regions. In the summer of 1880 he traversed the mountains of the Lebanon, and in 1881 he went to the island of Socotra, well known for its large number of endemics. In 1888–89 he visited Yemen, in Arabia. In 1891, 1892, and 1894 Schweinfurth made three journeys through the northern parts of Abyssinia occupied by Italy as Colonia Eritrea. There he brought together a very considerable collection of more than 4900 numbers, of which he published an enumeration in the Bull. Herb. Boissier, ii., iv., and vii. It is to be regretted that it remained a fragment, comprising only the families up to Balsaminaceæ after Engler's system.

In 1888, Schweinfurth removed from Cairo to Berlin, where he lived in a small house, until it became dilapidated, in a corner of the old Botanic Garden at Schoeneberg. The winter months he always spent in northern Africa, especially in Egypt: in 1901, 1906, and 1908 he stayed in Algeria and Tunis, making botanical collections of nearly 2500 numbers. In all he collected at least 18,000 numbers of plants, generally of numerous specimens prepared with the utmost care and skill.

But Schweinfurth was not only a botanist; he also contributed considerably to geography, geology, zoology, ethnography, and archæology, and after his death, on the 19th September, 1925, in his 89th year, representatives of all these sciences followed his coffin at his funeral in the Botanic Garden at Dahlem. Forty-nine learned societies had made him corresponding or honorary member, the Linnean Society on the 5th May, 1887. A list of his papers, containing 433 titles, is given in the third edition

of his standard work, 'Den Kerzen von Afrika,' published in 1918, fifty years after the beginning of his great voyage.

[JOHANNES MILBRAED.]

LEONARD JOHN SEDGWICK was born on 27th April, 1883. He graduated from Pembroke College, Cambridge, taking the Classical Tripos in 1905, and subsequently passed into the I.C.S.

He was interested in botany even before his Cambridge days, and though it was not one of his subjects there, he often joined the botanical excursions arranged for botany students.

Being a man of very marked ability, and with the critical faculty strongly developed, it was natural that some of his energy in a new country should have been diverted to a study of its flora. One of his earlier interests in India was the collection of Mosses, and this resulted in the publication of three 'Lists of Mosses from Western India' in 1910, 1911, and 1913 respectively. In the following year he began, in collaboration with the writer, a study of the flora of North Gujarat, which was considerably interrupted by the War and by Sedgwick's transfer to another district, but which resulted in the publication of 'Plants of Northern Gujarat' in 1918, while in the same year he published the 'Cyperaceæ of the Bombay Presidency.' For a number of years he had been specially interested in the Gramineæ and Cyperaceæ, two difficult families which the professional botanist is often only too glad to leave alone.

After the end of the War he was one of those chiefly responsible for the establishment of the 'Journal of Indian Botany,' a project in which he was keenly interested. He was also a frequent contributor to its pages.

During 1919 he wrote several critical reviews dealing, in each case, with a small group of species in a genus and clearing up difficult points of uncertainty in nomenclature or synonymy. These included species of *Zizyphus*, *Euphorbia*, *Trichodesma*, and *Alysicarpus*, his paper on "*Alysicarpus rugosus* DC. and its Allied Species" being his first contribution to the new 'Journal of Indian Botany.'

Besides his systematic publications, his interest in ecological work is apparent in his "Analyses of some Bombay Woody Species from an Œcological Standpoint," also published (in the 'Indian Forester') in 1919.

In this and the following years he published several new Indian species, probably all good "Linnæan" species, as he was by no means in accord with those who believe in extensive "splitting." These included species of *Habenaria*, *Leucas*, *Christisonia*, *Phyllanthus*, *Impatiens*, *Ceropegia*, *Boucerosia*, and *Canscora*.

These notes do not include references to the full list of his published botanical work, but will serve to indicate its range.

Sedgwick, however, was very far from being a one-sided man. To his colleagues in the Civil Service he was an able administrator; to us he was a botanist; to the linguist he was a linguist, speaking fluently a considerable number of Indian languages.

With the meteorologists he was able to discuss critically the weather forecast and allied problems, while to the average man he was obviously scholarly and well-read. In the later years of his short life he was put in charge of the Census, and threw himself into this work with characteristic energy, soon adding ethnology to his other subjects. His chief regret at this period was that he had no time for botany.

This brief account cannot be closed without saying something about Sedgwick as a man. He married in 1911 and was devoted to his wife and four children. Like many men of exceptional intellect he did not "suffer fools gladly," and for this reason he was not widely popular amongst the men of his acquaintance, and more especially amongst his seniors in the service. But to those who knew him best he was a true friend and one whose friendship was much valued and was, perhaps, not lightly bestowed.

His sudden death in India from enteric on 27th June, 1925, at the early age of 42 and at the height of his mental powers was indeed a tragedy to those who knew and loved him.

He was elected a Fellow of the Linnean Society in 1916, though he never contributed to the Society's publications. [W. T. S.]

Henry Charles Stone, who died at Bath on the 13th March, 1926, in a nursing home after a fortnight's illness following failing health, was born in that city on the 14th September, 1855, and was one of three brothers in the Linnean Society of whom two are still among our Fellows. Educated at Clifton College, he passed as a solicitor in 1878, and four years later entered the firm in which he was a partner to the end of his life. He was prominent in the life of the community of Bath, unveiling tablets to many who had been celebrated inhabitants and encouraging study in natural history. He was cremated at Woking Crematorium on the 18th March; he leaves one son, Major Reginald C. Stone. The date of his election into the Linnean Society was 7th December, 1882.

The writer has to thank the partners of our deceased Fellow, Messrs. King & Wardle, for particulars incorporated in the foregoing notice. [B. D. J.]

Miss Eva Whitley, who died on the 22nd February, 1926, was educated partly in England but mainly in Paris. She studied science at Bedford College, and was engaged in teaching at the Maida Vale High School. She attended the lectures on geology by Prof. Bonney at University College. She graduated B.Sc. with honours at the London University in 1891.

In 1892 she joined the Geologists' Association and frequently attended the excursions. She taught and lectured on science for the London County Council and at various private schools. She was a keen botanist, and was elected a Fellow of our Society on the 5th December, 1907. [H. W. Monckton.]

The death of our Foreign Member Prof. Johan Nordal Fischer Wille was announced at our Aniversary Meeting on the 22nd May, 1924, but, owing to the absence of details, no obituary could then be prepared. Since that time information has reached us which enables us to present a sketch of one of the most distinguished botanists of Norway.

He was born on the 28th October, 1858, at Hoböl, in the province of Smaalenene, near Christiania (Oslo), the son of a country doctor. He early showed a fondness for botany, in which he was encouraged by his father; he knew the local plants when ten years old. Soon after his 13th birthday he came to Christiania for schooling, and took part in Prof. Blytt's students' excursions. His education was fitful owing to his tendency to asthma and chronic throat-catarrh, but he devoted his attention to botany and geology, intending to become a teacher, in the end choosing botany as his main study. When Prof. Axel Blytt in the autumn of 1877 began a tour abroad, Wille deputized for him in the Museum, and afterwards studied the freshwater algæ collected on that tour. He then studied under Wittrock in Uppsala, where, in default of a laboratory, a large table in Wittrock's bedroom served: here he discovered the union of gametes in *Trentepohlia umbrina*, a form abundant in the neighbourhood, and this formed the subject of his first printed paper. Later on he was entrusted with working up the algal material collected by Kjellman during Nordenskiöld's travels in Novaja Semlaya. Wille always looked upon his residence in Uppsala as of the greatest influence upon his life-work. In 1883 he became the "Regnell Amanuensis" at the State Museum for three years. In 1885 he put forward for his doctorate 'Bidrag til Algernes physiologiske Anatomi' (Contribution to the physiological anatomy of the Algæ). Wille became Professor of Botany at the Stockholm Highschule when Warming left that post. He travelled at State expense through Sweden, Denmark, Germany, Switzerland, and Austria to inspect their laboratories so as to adopt their methods. On the death of Schübeler in 1892, Wille succeeded to the post of Professor in the University of Christiania and Director of the Botanic Garden, which he occupied until his death.

The bibliography of his papers, especially those on algæ, is extensive, and may be consulted in the 'Berichte der Deutschen botanischen Gesellschaft,' xlii. (1924) (119)–(130), extracted from a more elaborate list in the Oslo 'Nyt Magazin for Naturvidenskaberne,' lxii. (1924), pp. 27–51. We are indebted to the obituary by Herr H. W. Wollenweber in the Berlin 'Berichte' for the main facts in the foregoing statement. [B. D. J.]

BENEFACTIONS.

List *in accordance with Bye-Laws, Chap.* XVII. *Sect.* 1, *of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.*

1907.

Royal University of Uppsala: Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).

Royal Society: Third and final grant towards 'Biscayan Plankton,' £50.

The Trustees of the Percy Sladen Memorial Fund: First grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

1908.

Prof. Gustaf Retzius: Plaster cast of bust of Carl von Linné modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby; the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S.: Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

1909.

The Trustees of the Percy Sladen Memorial Fund: Second grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

Prof. James William Helenus Trail, F.R.S., F.L.S.: Gift of £100 in Trust, to encourage Research on the Nature of Protoplasm.

1910.

Royal Society: Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.

Sir Joseph Hooker: Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by James Tassie.

Prof. J. S. Gardiner: Payment in aid of illustrations, £35 0*s.* 6*d.*

Sir Frank Crisp: Donation in Trust for Microscopical Research, £200.

The Trustees of the Percy Sladen Memorial Fund: Third grant towards publication of Prof. Stanley Gardiner's Researches in the Indian Ocean, £200. (For third volume.)

1911.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the Indian Ocean Researches, £70.

The same: First Donation towards the fourth volume, £130.

1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15*s.* 2*d.*

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the Indian Ocean Researches, £140.

The same: First Donation towards the fifth volume, £60.

1913.

Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating Oenotheras, £60.

Sir Frank Crisp, Bt.: Wallichian Cabinets, £50.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

1914.

Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.

Miss Foot: Cost of illustration of her paper on *Euschistus*.

The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.

The same: First Donation towards the sixth volume, £190.

1915.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.

Miss Foot: Cost of second paper on *Euschistus*, £32 10*s.*

Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.

The same: towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.

Miss Marietta Pallis: Instalment of cost of her paper on Plav, £30.

Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.

Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

1916.

Mr. E. Heron-Allen: Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.

Messrs. H. Takeda and C. West: Contribution towards the illustration of their paper, £40.

Royal Society: Contribution towards the illustration of two papers by Prof. Dendy, £40.

The same: Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.

The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.

Miss Marietta Pallis: Balance of cost of her paper on Plav, £90 16*s.* 6*d.*

Sir Frank Crisp, Bt.: Phototyped copy of Dioscorides from the 'Codex Aniciæ Julianæ' at Vienna.

1917.

British Ornithologists' Union, etc.: Contribution towards cost of Mr. H. N. Ridley's paper, £20.

The Royal Society: Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.

Sir Frank Crisp, Bt.: 'Lindenia,' Ghent, 1891–1901. 17 vols. sm. fol.

1919.

Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.–xl. (1884–1912) and the Botanic entries in the 'Proceedings' for the same period.

1920.

The Royal Society: Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.

The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandii*, Part II., £60.

1921.

The Percy Sladen Memorial Fund: Additional Grant in aid of publication of 'Transactions,' 2nd ser., Zoology, vol. xvii. part 4, £72 10*s.*

The same: Grant in aid of publication of four papers on the Houtman Abrolhos Islands, £100.

The Royal Society: Donation in aid of papers by Mr. N. E. Brown and Mr. S. L. Moore, £90.

Dr. W. Rushton Parker: Donation of a large series of portraits of Naturalists and Persons after whom Genera have been named, and work on rearrangement and annotation of the entire collection.

Prof. C. S. Sargent, F.M.L.S.: Eight volumes issued by the Arnold Arboretum, including "The Bradley Bibliography."

Dr. B. Daydon Jackson: MS. Catalogue of each sheet in the Linnean Herbarium; bound in two volumes folio.

1922.

The late Sir Joseph Hooker: Donation of his Medals and Decorations. (Reversion to Linnean Society on Lady Hooker's decease.)

Anonymous donation in aid of publication of the late Dr. E. A. Newell Arber's paper, entitled "Critical Studies of Coal-Measure Plant-impressions," £60.

The Percy Sladen Memorial Fund: Cost of printing 'Transactions,' 2nd. ser., Zoology, vol. xviii. pt. i.

1923.

Dr. W. Rushton Parker: (1) Donation of Oxford New English Dictionary; vols. i.–ix., vol. x. in parts, 4to, 1888–1923. (2) Encyclopædia Britannica; ed. XI. Cambridge, 1920–22. 32 vols. 4to.

E. Heron-Allen, Esq., F.R.S.: Contribution of £25 towards the cost of paper on the Foraminifera of Lord Howe Island.

1924.

The Percy Sladen Memorial Fund: Cost of printing 'Transactions,' 2nd. ser., Zoology, vol. xviii. pt. ii.

1925.

An Anonymous Donor: New Presidential Chair, emblazoned with the Arms of the Society.

1926.

Mr. A. D. Michael: A large number of Books and Pamphlets from his Library.

The late Mr. A. O. Walker: £200 free of Legacy Duty.

An Anonymous Donor: £100 to establish a Fellowship in memory of the late Prof. E. A. Minchin, F.R.S., Sec.L.S.

The Royal Society: Donation in aid of publication of Mr. G. P. Farran's paper on Biscayan Plankton.—Part 14. The Copepoda, £60.

The late Mr. Frank Morey: £100 free of Legacy Duty.

The late Mr. George Lewis: Books and pamphlets on Entomological subjects.

TREASURER'S ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1926.

(Presented at the Anniversary Meeting, May 27th, 1926.)

Receipts and Payments of the Linnean Society from May 1st, 1925, to April 30th, 1926.

General Account.

Receipts.			£	s.	d.
To Balance at 1st May, 1925	£84	5 0			
Do. deposits, Fellows' postal account	57	18 8			
„ Cash in hand	2	15 7			
			144	19	3
„ Interest on Investments			348	17	9
„ Admission Fees			124	0	0
„ Annual Contributions			2368	12	6
„ Sales of Publications:—					
Transactions	£ 41	1 6			
Journals	158	1 2			
Proceedings and Catalogues	101	17 2			
			300	19	10
„ Proceeds of Sale of £50 4 per cent. Victory Bond			45	10	1
„ Fellows' postal account, deposits			10	5	10
„ Donations in aid of Publications			62	5	0
„ Legacy from the late A. O. Walker, F.L.S.			200	0	0
„ Miscellaneous Receipts			24	10	3
			£3630	0	6

Payments.			£	s.	d.
By Taxes and Insurance			30	5	6
„ Repairs and Furniture			167	13	4
„ Coal, Electric Current, and Gas			87	14	10
„ Salaries			1208	3	8
„ Library:—					
Books (New Books £30 15 10)	£289	12 10			
Binding	152	4 0			
			441	16	10
„ Expenses of Publications:—					
Printing	£640	11 9			
Illustrations	74	7 4			
Distribution	42	6 4			
Library Catalogue	253	19 6			
			1011	4	11
„ Miscellaneous Printing and Stationery			160	4	5
„ Petty Expenses (including Tea and Postage)	£127	19 6			
„ Fellows' postal account	6	3 10			
			134	3	4
„ Linnean Medal			15	0	0
„ Balance at 30th April, 1926	*£307	13 3			
Do. deposits, Fellows' postal account	62	0 8			
„ Cash in hand	3	19 9			
			373	13	8
			£3630	0	6

* Includes A. O. Walker's Legacy.

Separate Account.

	£	s.	d.		£	s.	d.
To Balance at 1st May, 1925:—				By Trail Award to Prof. R. Chambers	20	17	6
Westwood Fund £30 6 10				„ Hooker Lecture Fund:—			
Trail Award Fund 20 11 8				Award to Lecturer	26	5	0
Crisp Award Fund 27 12 1				„ Minchin Fellowship Fund:—			
Hooker Lecture Fund 57 12 4				Purchase of £100 London County 5 per cent. Stock 1940–60	101	11	0
Goodenough Fund 5 5 0				„ Annual Dinner Fund:—			
	141	7	11	Cost of Annual Dinner	34	2	6
„ Anonymous Donation Minchin Fellowship Fund	100	0	0	„ Balance at 30th April, 1926:—			
„ Annual Dinner Fund Receipts	34	2	6	Westwood Fund £39 7 2			
„ Interest on Investments:—				Trail Award Fund 3 4 2			
Westwood Fund £9 0 4				Crisp Award Fund 35 2 1			
Trail Award Fund 3 10 0				Hooker Lecture Fund 52 11 2			
Crisp Award Fund 7 10 0				Goodenough Fund 10 12 2			
Hooker Lecture Fund 21 3 10				140 16 9			
Goodenough Fund 5 7 2				*Less*: Minchin Fellowship Fund overdrawn 1 11 0			
	46	11	4		139	5	9
	£322	1	9		£322	1	9

Investments on April 30th, 1926.

General Account.

£	s.	d.				*Value, 30th April, 1926.* £	s.	d.
450	0	0	Forth Bridge Railway 4 per cent. Stock (Library Fund)	@	77	346	10	0
1000	0	0	Metropolitan 3 per cent. Stock 1941	@	80	800	0	0
1200	0	0	India 3 per cent. Stock	@	59⅝	714	0	0
1000	0	0	Eastern Bengal Railway 4 per cent. Irredeemable Debenture Stock	@	77	770	0	0
1000	0	0	Great Western Railway 4 per cent. Debenture Stock	@	81	810	0	0
312	0	0	London Midland & Scottish Railway 4 per cent. Preference Stock 1923	@	71	221	10	4
3296	0	0	4½ per cent Conversion Stock 1940–44	@	96¼	3172	8	0
530	0	0	East India Railway 3½ per cent Debenture Stock (transferred from Tagart Fund)	@	67	355	2	0
						£7189	10	4

Separate Account.

£	s.	d.					*Value, 30th April, 1926.* £	s.	d.
£912 9 5	232	5	0	Metropolitan Water Board 3 per cent. "B" Stock	(Westwood Fund)	@ 63	146	6	4
	638	4	5	Ditto ditto	(Hooker Lecture Fund)	@ 63	402	1	7
	42	0	0	Ditto ditto	(Goodenough Fund)	@ 63	26	9	2
	100	0	0	New South Wales 3½ per cent. Stock, 1930–50	(Trail Award Fund)	@ 75	75	0	0
	300	0	0	2½ per cent. Consolidated Stock	(Crisp Award Fund)	@ 55	165	0	0
£200 0 0	50	0	0	4 per cent. Victory Bonds	(Westwood Fund)	@ 92	184	0	0
	50	0	0		(Hooker Lecture Fund)				
	100	0	0		(Goodenough Fund)				
	100	0	0	London County 5 per cent. Stock 1940–60	(Minchin Fellowship Fund)	@ 101	101	0	0
							£1099	17	1

HORACE W. MONCKTON, *Treasurer.*

We have (in conjunction with the Professional Auditor, who certifies as to all details) audited the Accounts of the Society for the year ended 30th April, 1926, and found them correct. We have verified the Investments and Bank Balances.

Dated this 18th May, 1926.

W. B. KEEN, *Chartered Accountant.*

A. B. RENDLE,
E. A. BUNYARD,
W. T. CALMAN,
ROBERT PAULSON,
HENRY NICHOLAS RIDLEY. } *Auditors.*

ADDITIONS AND DONATIONS

TO THE

LIBRARY.

1925–1926.

Note.—The sizes of the books are given in centimetres, the height and width being shown to the nearest centimetre, *e. g.*, 12·5×9·5 cm. is taken as 13×10.

Abrams (Le Roy). An illustrated Flora of the Pacific States. Vol. 1. Ophioglossaceæ to Aristolochiaceæ. *Stanford University, Cal., U.S.A.*, 1923. 27×18.

Acarina. [Papers on the Acarina. A collection, by various authors, in 23 volumes, with some unbound papers.] [A. D. Michael.]

Agardh (Jakob Georg), *Præses.* In systemata Algarum hodierna adversaria. *Resp.* N. J. Wetterquist. *Lundæ*, 1844. 21×13.

—— Om Bladets Udvikling hos Algerne. (Beretningen om Mødet, skand. Naturforsk., Kjøbenhavn 1873 [1874].)

—— Om structuren hos *Champia* och *Lomentaria*, med anledning af nyare tydningar. (Öfversigt K. V. Akad. Förhandl., 1888, no. 2.)

—— Om så kallad mager jord och om den skörd denna förmår bära. (Landtbruks-Akad. Handl. och Tidskr., 1897, H. 4.)

[4 papers: K. Universitets-Biblioteket, Lund.]

Agassiz (Jean Louis Rudolph). Nomenclator zoologicus continens nomina systematica generum animalium tam viventium quam fossilium, . . . *Solodurі*, 1842–46. 27×22. [A. D. Michael.]

Anthony (H. E.). Mammals of Porto Rico, living and extinct. (Scientific Survey of Porto Rico & the Virgin Islands, vol. 9, pt. 1 & 2.) *New York*, 1925. 25×16.

Apuleius Barbarus. The herbal of Apuleius Barbarus, from the early twelfth-century manuscript formerly in the Abbey of Bury St. Edmunds (MS. Bodley 130). Described by Robert T. Gunther . . . *Oxford*, 1925. 27×20. [Capt. E. G. Spencer-Churchill.]

[Printed for presentation to the members of the Roxburghe Club.]

Arber (Agnes). Monocotyledons: a morphological study. *Cambridge*, 1925. 27×18.

—— Studies in the Gramineæ. 1. The flowers of certain Bambuseæ. (Ann. Bot., vol. 40, no. 158, 1926.) [Author.]

[Ardoino (Honoré)]. Catalogue des plantes vasculaires qui croissent spontanément aux environs de Menton et de Monaco. . . *Turin*, 1862. 24×16. [H. S. Thompson.]

Areschoug (Fredrik Wilhelm). Revisio *Cuscutarum* Sueciæ. *Lundæ*, 1853. 20×13. [K. Universitets-Biblioteket, Lund.]

Ascroft (Robert W.). The conservation of the Nation's vegetation: the effect of smoke on plant-life. *S.l.e.a.* 18×12. [Author.]

Aslin (Mary S.). *See* **Rothamsted Exper. Station.**

Atwood (William G.) & Johnson (A. A.). Marine structures: their deterioration and preservation. Report of the Committee . . . of the National Research Council. *Washington, D.C.*, 1924. 23×16.

[National Research Council.]

Audas (James Wales). Flora of Victoria. (Victorian Year Book, 1924–25.) *Melbourne*, 1925.

Audas (James Wales.) Plants introduced from Abroad. (*Ex* 'Save Australia: a plea for the right use of our Flora and Fauna,' ed. by Sir James Barrett, *Melbourne*, 1925.)
[2 papers: National Herbarium, Melbourne.]

Audas (J. W.) & Morris (P. F.). Plant Immigrants. (Journ. Dept. Agric. Victoria, Feb. 1925.) [National Herbarium, Melbourne.]

Babington (Charles C.). *See* **Balfour (J. H.).**

Bailey (Liberty Hyde). Gentes herbarum. I.–VI. *Ithaca, N.Y.*, 1920–25. 26×18. [Author.]

Baines (Thomas). Explorations in South-West Africa. *London*, 1864. 22×14. [Miss Edith M. Wynne.]

Baker (Edmund Gilbert). The Leguminosæ of Tropical Africa. Pt. 1. Suborder Papilionaceæ. *Pleiospora* to *Tephrosia*. *Ghent*, 1926. 28×19. [Author.]

Baker (E. C. Stuart). *See* **India (British).** The Fauna.

Baker (John Gilbert). *See* **Davy (J. B.).**

Balbiani (Éduard Gérard). Mémoires sur le développement des Aranéides. (Bibliothèque de l'Ecole des Hautes Etudes, *&c.*, tome 4, no. 6, 1873.) [A. D. Michael.]

Balfour (Francis Maitland). *See* **Foster (*Sir* Michael).**

Balfour (Frederick Robert Stephen). Botany [of Peeblesshire]. Reprinted from The History of Peeblesshire, vol. 1, chap. 10. [Glasgow, 1925.] *S.l.e.a.* 22×14. [Author.]

Balfour (John Hutton), Babington (C. C.), & Campbell (W. H.). A catalogue of British Plants. Pt. 1. Ed. 2. *Edinburgh*, 1841. 22×15.
[—— —— ——] —— Ed. 3. *Edinburgh*, 1851. 18×12.
[H. S. Thompson.]

Ball (John). The Central Alps: . . . being the second part of the Alpine Guide. New ed. *London*, 1870. 18×12. [H. S. Thompson.]

Barbey *afterw.* **Barbey-Boissier (William).** *See* **Burnat (E.).**

Barrett-Hamilton (G. E. H.). *See* **Hinton (M. A. C.).**

Beddard (Frank Evers). Natural history in Zoological Gardens. *London*, 1905. 20×15. [A. D. Michael.]

Bennett (Arthur). Notes on the Flora of the Orkney Isles. (Trans. & Proc. Bot. Soc. Edinb., vol. 27, pt. 1, 1916.) [Col. H. H. Johnston.]

—— Notes on British *Carices*. (*Ibid.*, vol. 29, pt. 2, 1925.) [Author.]

—— *See* **Johnston (H. H.).**

Bergen. Bergens Museum. Bergens Museum 1925. [Centenary Publication.] *Bergen*, 1925. 24×16. [The Director.]

Berlese (Antonio). Acari, Myriopoda et Scorpiones hucusque in Italia reperta. Fasc. 1–101. [Imperfect set.] *Padova*, 1884–1903. 25×18.

—— —— Ordo Mesostigmata (Gamasidæ), *&c.* *Patavii*, 1892. 23×15.

—— —— Ordo Prostigmata (Trombidiidæ), *&c.* *Patavii*, 1893. 23×15.

—— —— Ordo Cryptostigmata (Oribatidæ Sarcoptidæ), *&c.* *Portici*, 1896–97. 23×15.

—— —— Ordo Pauropoda: auctore P. Silvestri, *&c.* *Portici*, 1902. 25×17.

—— —— Classis Diplopoda: auctore P. Silvestri. Vol. 1. Anatomie. Pt. 1. *Portici*, 1903. 27×18. [A. D. Michael.]

—— Gli Insetti. Vol. 2. *Milano*, 1925. 29×20.

Bews (John William). Plant Forms, and their evolution in South Africa. *London*, 1925. 22×14.

Black (J. M.). Additions to the Flora of South Australia. No. 23. (Trans. Roy. Soc. S. Australia, vol. 49, 1925.) [Author.]

—— *See* **Cleland (J. B.).**

Blanquet. *See* **Braun-Blanquet (J.).**

Bolton (Herbert). Insects from the Coal Measures of Commentry. (British Museum publication.) *London*, 1925. 22×14.
[Trustees of the British Museum.]

Bonnier (Gaston Eugène Marie). Flore complète illustrée en couleurs de France, Suisse et Belgique. Vol. 8, fasc. 71–80. *Paris*, [? 1925–26.] 32×22.

Börgesen (Frederik C. E.). Note on the development of the young thallus of *Cymopolia barbata* (L.) Lamour. (*Ex* De Toni, "Nuova Notarisia," ser. 36, 1925.)

—— Marine Algæ from the Canary Islands, especially from Teneriffe and Grand Canaria. 1. Chlorophyceæ. (Kgl. Danske Vidensk. Selskab, Biol. Meddel. vol. 5, no. 3, 1925.) [2 papers: Author.]

Boschma (H.). *See* **Siboga-Expeditie,** Livr. 101.

Bose (*Sir* Jagadis Chunder). The nervous mechanism of plants. *London, &c.*, 1926. 23×14. [Messrs. Longmans, Green & Co.]

Bose (Sahay Ram). Polyporaceæ of Bengal. Pt. 7. (Rept. Indian Assoc. for the Cult. of Science, 1920–21, *Calcutta*, 1923.)

—— Une Polyporacée nouvelle de l'Inde. (Bull. Trimest. de la Soc. Mycol. de France, vol. 39, no. 4, 1924.)

—— Three new species of Bengal Polyporaceæ. (Bot. Gaz., vol. 78, no. 1, 1924.) [3 papers: Author.]

Botanical Exchange Club of the British Isles. List of desiderata for 1895. . . *S.l.e.a.* [C. E. Salmon.]

Bower (Frederick Orpen). Botany. *See* **Evolution.**

Braid (Kenneth William). The measurement of Light for ecological purposes. (Journ. Ecol., vol. 11, no. 1, 1923.)

—— Some observations on *Fistulina hepatica* and hollow stag-headed Oaks. (Trans. Brit. Mycol. Soc., vol. 9, pt. 4, 1924.)

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Britten, H., Ptiliidæ of the Seychelles, 12.
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Browne, E. T., Siphonophora, 12.
Bunting, B., elected, 7; sec. reading, 4; proposed, 1.
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Butler, Dr. A. G., deceased, 48; obituary, 74,
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Calman, Dr. W. T., elected Councillor, 50; elected Zoological Secretary, 51; on the influence of the sea on marine organisms, 11.
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Carter, Dr. N., admitted, 45; elected, 37; sec. reading, 32; proposed, 29.
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Clarke, S. H., *see* Holden, H. S.
Clutterbuck, Sir Peter H., elected, 7; sec. reading, 4; proposed, 1.
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Cory, R., elected Councillor, 50.
Cotton, A. D., elected Councillor, 50.
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Crane, M. B., elected an Associate, 16; sec. reading, 12; proposed, 7.
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Crawshay, L. R., Sponge Fishery investigation in the British West Indies, 6.
Cunningham, J. T., The nuptial pads of Frogs and Toads, 47.
Cupressus macrocarpa × *nootkatensis*, a new hybrid conifer (Jackson), 29.
Cuticles of Lauraceæ (Bandulska), 41.

Da Fano, Dr. C. D., admitted, 39; elected, 37; sec. reading, 32; proposed, 29.
Dakin, Prof. W. J., elected, 52; sec. reading, 48; proposed, 45.
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Dalziel, Dr. J. M., on vegetation of West Africa, 15.
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Davidson, A. H., elected, 7; sec. reading, 4; proposed, 1.
Dean, Miss I., *Ainigmaptilon haswelli*, n. g. et sp., 47.
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Debbarman, P. M., deceased, 48; obituary, 78.
Deeks, W. J. R., elected, 40; sec. reading, 37; proposed, 32.
Denny, A., withdrawn, 49.
Dixon, H. N., elected Councillor, 50; on *Trematodon* in stream-crevices of volcanoes, 34.
Drinkwater, Dr. H., deceased, 48; obituary, 78–80.
Druce, Dr. G. C., showed some British Plants, 6.
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Edwards, W. N., on Lauraceæ, 42.
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England, Miss H. M., elected, 37; sec. reading, 32; proposed, 29.
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Forrest, H. E., admitted, 32.
Fraser, Miss E. A., admitted, 7; elected, 4; sec. reading, 1.
Fritch, Prof. F. E., Councillor retired, 50.
Fry, Miss E. J., admitted, 48; elected, 37; sec. reading, 32; proposed, 29.
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Fungus in the tissues of Coniferæ (Lewis), 7.

Gamble, J. S., deceased, 48; obituary, 80.
Gardiner, Prof. J. S., elected Councillor, 50.
Garland, *see* Lester-Garland, L. V.
Gates, Prof. R. R., Vegetation of the Amazon Basin, 13.
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Gibb, Mrs. E. M. H., admitted, 48; elected, 45; sec. reading, 43; proposed, 40.
Good, R. D'O., The genus *Empetrum*, 46.
Goodrich, Prof. E. S., elected Councillor, 50.
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Gordon, Prof. W. T., admitted, 12.
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Griffiths, Dr. B. M., The phytoplankton of the Isle of Anglesey, &c., 47.
Gunther, Dr. R. W. T., elected Councillor, 50; on an early MS. herbal of Apuleius Barbarus, 40.
Guppy, H. B., deceased, 48.

Haines, Dr. F. M., admitted, 45; elected, 37; sec. reading, 32; proposed, 29.
Halket, Miss A. C., elected Councillor, 50.
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Harmer, Sir S. F., on "Persistent Growth" in the Water-Vole, 19; on the Gorilla, 2.
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Henderson, J. R., deceased, 48; obituary, 81.
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Hosking, J. E., admitted, 16; elected, 7; sec. reading, 4; proposed, 1.
Howarth, F., admitted, 48; elected, 43; sec. reading, 39; proposed, 37.
Hurst, Dr. C. C., Nature and origin of species in *Rosa*, 30–31.
Hyde, H. A., admitted, 16; elected, 7; sec. reading, 4; proposed, 1.

Iliffe, R. O., elected, 16; sec. reading, 12; proposed, 7.
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Johannsen, Dr. W. L., elected Foreign Member, 45; proposed, 37.
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Laing, E. V., elected, 52; sec. reading, 45; proposed, 43.
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Lowndes, A. G., admitted, 16; elected, 7; sec. reading, 4; proposed, 1.

MacBride, Prof. E. W., appointed V.-P., 52; elected Councillor, 50; on growth of teeth, 19.
McDonald, J., elected, 13; sec. reading, 7; proposed, 1.
Mackinnon, Dr. D. L., elected Councillor, 50.
Maiden, J. H., deceased, 48; obituary, 84–90.
Maire, Prof. R., elected Foreign Member, 45; proposed, 37.
Marsden-Jones, E. M., Fertilization of *Primula vulgaris*, 17.
Martin, Miss Isa, sec. reading, 52; proposed, 48.
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Matthews, D. J., Physical Oceanography of the Indian Ocean, 10.
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Monckton, H. W., appointed V.-P., 52; elected Councillor, 50; elected Treasurer, 51.
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Montgomery, S. K., elected, 7; sec. reading, 4; proposed, 1.
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Mukerji, S. K., admitted, 32; elected, 16; sec. reading, 12; proposed, 7; Aquatic and Marsh Vegetation of the Dal Lake of Kashmir, 55.
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Percival, Prof. J., appointed V.-P., 52; elected Councillor, 50.
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Pryde, J., admitted, 45; elected, 37; sec. reading, 32; proposed, 29.
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Ray, Dr. S. C., elected, 37; sec. reading, 21; proposed, 16.
Rayner, Dr. M. C., on mycorrhiza in Conifers, 9.
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Regan, C. Tate, elected, 52; sec. reading, 45; proposed, 43.
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Rich, Miss M. F., admitted, 45: elected, 37; sec. reading, 32; proposed, 29.
Ridley, H. N., elected Auditor, 43; on *Caytonia*, 28; on crater-vegetation in Java and Sumatra, 54; on *Litsea* and *Neolitsea*, 43.
Rintoul, Miss L. J., elected, 7; sec. reading, 4; proposed, 1.
Robinson, H. G., admitted, 12; elected, 7; sec. reading, 4; proposed, 1.
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Russell, Dr. E. S., elected Councillor, 50.

Sager, J. L., admitted, 16; elected, 7; sec. reading, 4; proposed, 1; exhibited abnormal *Primula*, 40.
Salisbury, Dr. E. J., elected Councillor. 50; on the Caytonales and modern Flowering Plants, 28; on Seedlings, 5.
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Schweinfurth, Prof. G. A., deceased, 48; obituary, 96.
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Scott, Dr. Hugh, Ciidæ (Coleoptera) of the Seychelles, 9.
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Stern, F. C., admitted, 12; elected, 7; sec. reading, 4; proposed, 1.
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Stream, E. J., proposed, 52.

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Tabor, R. J., elected Councillor, 50.
Taig (*née* Rees), Mrs. E. M., withdrawn, 49.
Tansley, A. G., elected, 52; sec. reading, 48; proposed, 45.
Taylor, J., withdrawn, 49.
Thomas, Dr. E. N. Miles, on Seedlings, 5.
Thomas, Dr. H. H., elected, 2; on aerial photographs, 33; on grouping of Ferns, 36; opened Discussion on the relation between the Caytoniales and modern Flowering Plants, 22–25.
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Voelcker, Dr. J. A., admitted, 12; elected, 7; sec. reading, 4; proposed, 1.

Wade, A. E., elected, 7; sec. reading, 4; proposed, 1.
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Walsh, Col. J. H. Tull, on endocrine glands, 20.
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Waterfield, R., admitted, 39; elected, 37; sec. reading, 32; proposed, 29.
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Wilkinson, H., elected, 40; sec. reading, 37; proposed, 32.
Williams, I. A., admitted, 52; elected, 40; sec. reading, 37; proposed, 32.
Williams, Miss M., admitted, 16; elected, 13; sec. reading, 7; proposed, 1.
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